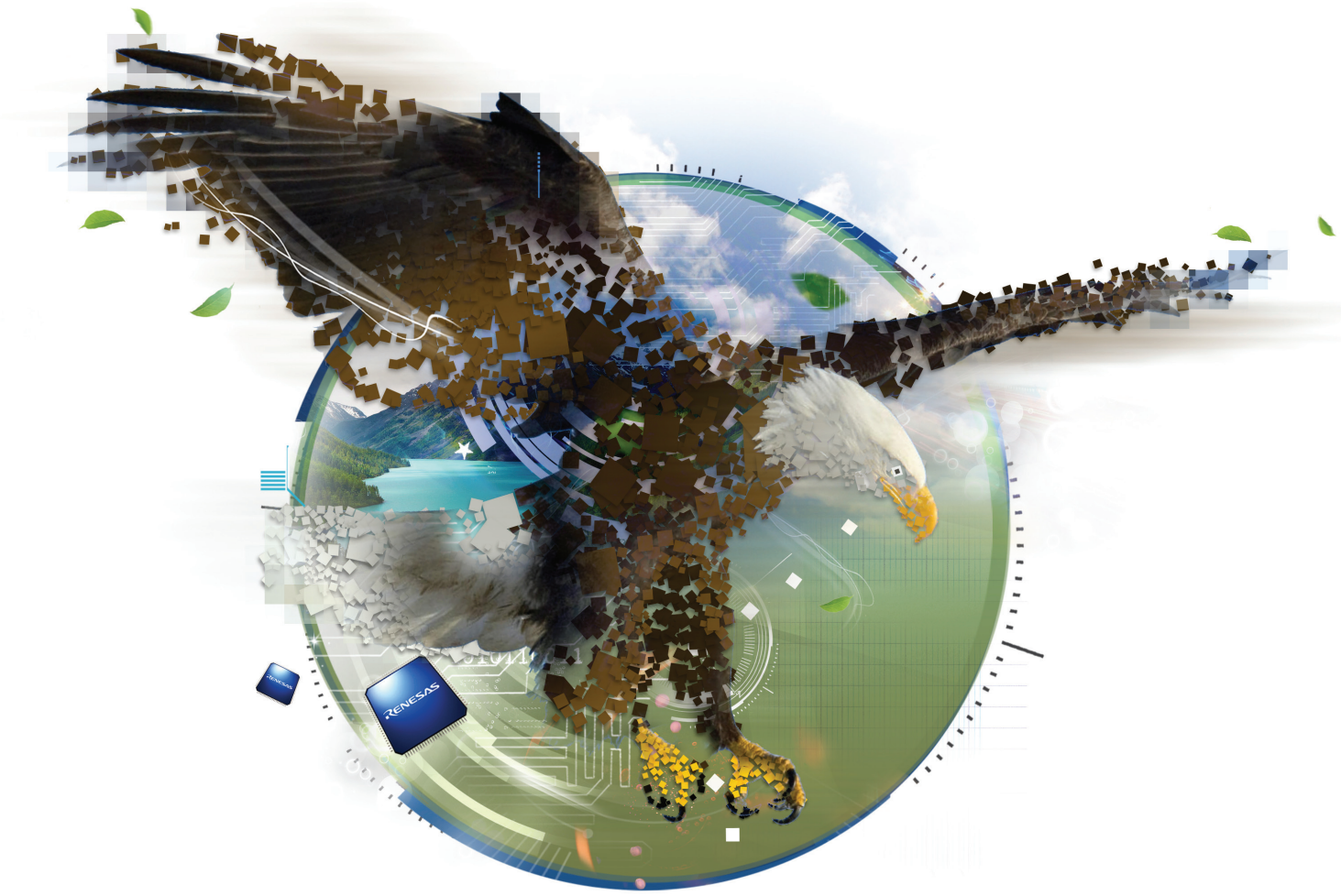
The Core Difference in Your Design

RX600/RX700 Microcontrollers



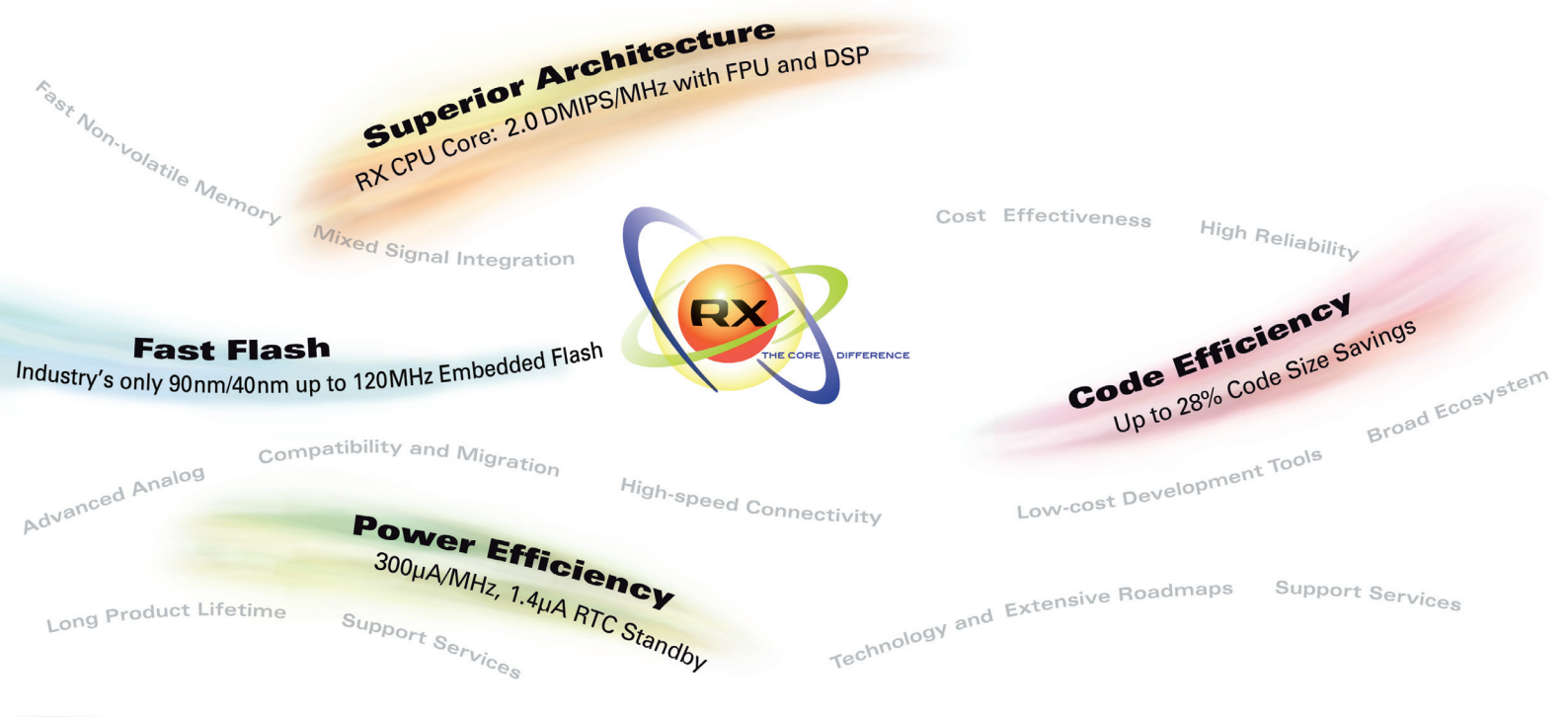
Renesas Electronics
www.renesas.eu

2015.02

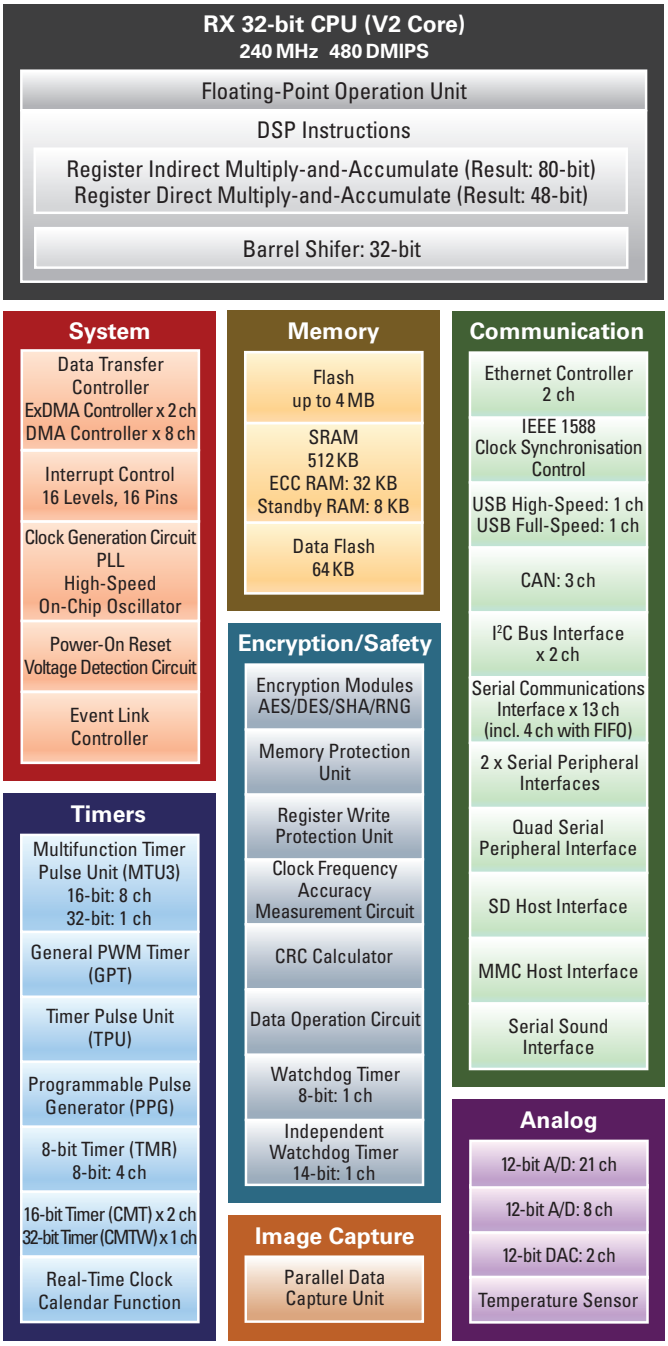
Performance without Sacrifice

The RX architecture is future oriented and feature rich. It's driven by a Renesas technology roadmap that focuses on the global environment and anticipates the enormous gains in sophistication that microcontroller-based products are expected to achieve in the next 10 to 20 years. Thus, the RX family of microcontrollers (MCUs) delivers superior performance in terms of core processing performance, code efficiency, and power consumption. An extensive portfolio of on-chip mixed-signal peripherals is available, and fast 90 nm/40 nm Flash memory is embedded. That Flash unleashes full CPU performance, feeding instructions to the 32-bit RX CPU with no delays – no waits, no stalls – maintaining the MCU's peak performance of 480 DMIPS. Memory acceleration isn't required, and the result is just pure, predictable performance.

Today designers are confronted with many critical design and implementation issues. RX MCUs are designed to solve these issues and help them create new innovative end-products faster and more easily than in the past.



Block Diagram & Features



- RX MCUs leverage Renesas' mature 90 nm/40 nm embedded Flash process, which is currently the fastest in the industry with a 8.3 ns maximum read access time and is designed for optimized power consumption all the way up to full 120 MHz operation.
- Design solutions in the RX600 series are scalable. Over 200 products are available now offering Flash memory from 32 KB to 4 MB and packages with 48 to 177 pins.
- Latest RX71M devices describe the top end of the RX platform. With a CPU clock frequency of 240 MHz, large embeded 4 MB Flash and 512 KB RAM combined with all the connectivity features these device are ideal for any gateway requirement.

Renesas is the number one MCU supplier worldwide[1], with a 30% market share.

- The companion low-voltage RX200 series are available since Spring, 2011. These more economical MCUs operate down to lower voltages (as low as 1.62 V), consume less power, and come in smaller packages and memory sizes.
- The RX111 provides the entry level 32-bit performance devices in small packages with USB and lowest power consumption not only in active, but also in RTC mode.
- The RX100, RX200 and RX600 share the same CPU core and integrate many of the same peripherals for easy migration between the three series.
- RX MCUs come with comprehensive system development support, including a vast range of easy-to-use boards, tools, software, middleware, and RTOSs from Renesas and third-party suppliers, comprising a rich ecosystem of products for accelerating progress in design cycles and shrinking time to market.

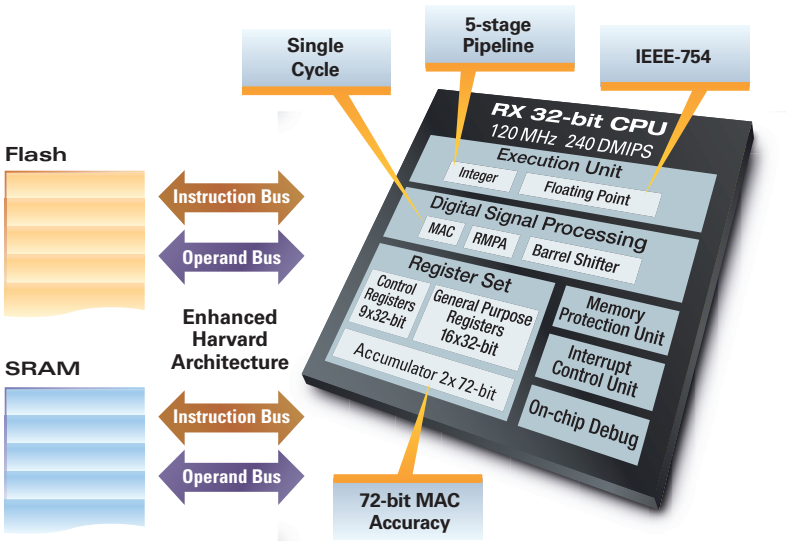
- Superior Architecture
  - RX CPU Core with FPU and DSP: up to 480 DMIPS, up to 240 MHz
  - Enhanced Harvard architecture and 5-stage pipeline
  - More than six internal busses
  - Multiple Direct Memory Access control
  - Rapid interrupt response
- Fast Flash
  - Industry's only 90 nm/40 nm up to 120 MHz embedded Flash
  - CPU receives instructions with no delays
  - Mature and reliable silicon process
- Power Efficiency
  - 300 µA/MHz, with all peripherals active
  - 1.4 µA RTC Deep Standby (RX631/63N)
  - < 1 mW per DMIPS
  - Extends battery life in portable applications
- Code Efficiency
  - Up to 28% code size savings[2] compared to popular 32-bit RISC MCUs on the market
  - Variable-length CISC instructions
  - FPU, DSP and bit manipulation instructions

Footnotes:
1: Source: Gartner 2009 Worldwide Semiconductor Market Share Database, March 2010 results
2: Source: Renesas internal testing

Advanced Design and Integration

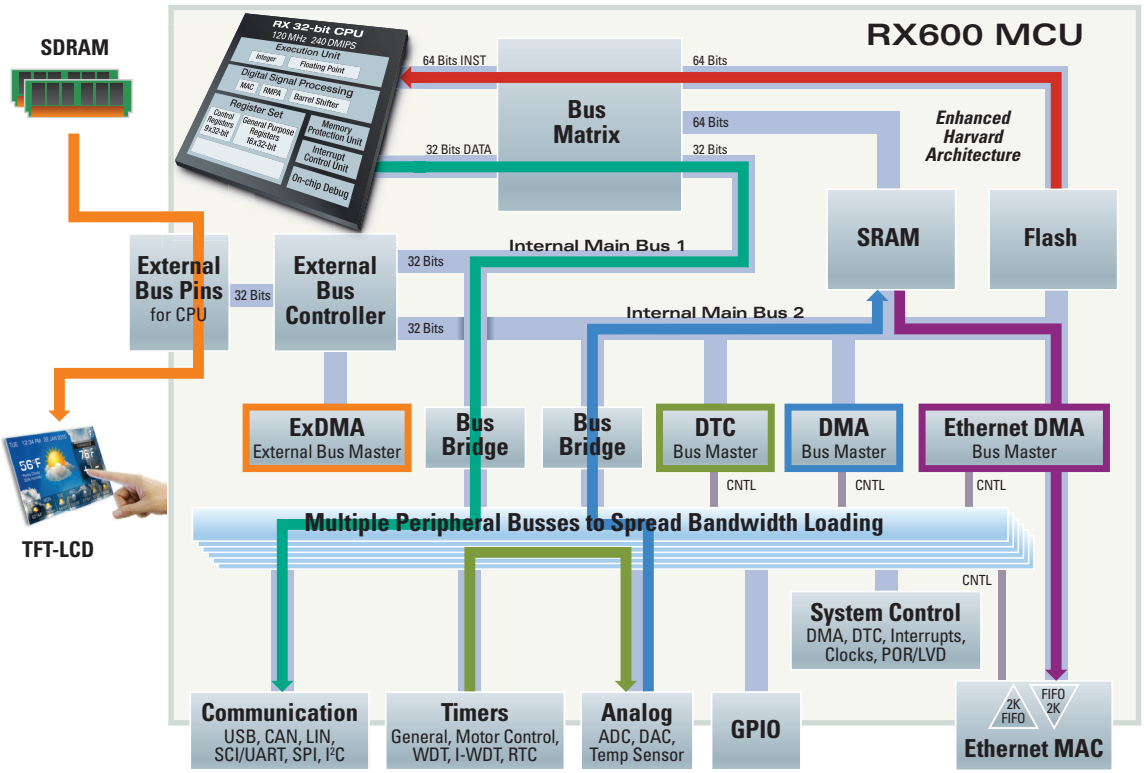
RX600 Key Benefits

The latest RXv2 Core marries the speed of a RISC architecture with the flexibility and code efficiency of a CISC architecture. The CPU interacts with the Flash and SRAM through an enhanced Harvard design. The RXv2 Core leverages the industry's fastest Flash memory, delivering up to 2.0 DMIPS/MHz and 4.39 CoreMark/MHz without wait states. Tightly coupled to the RX Core are the FPU, MAC, and RMPA (Repeat Multiply Accumulate), which are efficiently driven by DSP and floating point instructions to meet the growing demand of DSC (Digital Signal Controller) type applications.



Simultaneous Data Transfers

The RX Core uses a large number of parallel busses to handle simultaneous movement of data between the CPU core, Flash, SRAM, and peripherals. Six different peripheral busses enable a flexible distribution of slow and fast peripherals for optimized throughput. An external bus with an independent DMA can move data directly from one external device to another external device, such as a graphic frame buffer to a TFT-LCD panel.



Independent Data Transfers

- *Fetch instructions*
- *Transmit USB data*
- *Move RGB data from external SDRAM to TFT-LCD*

Interleaving Data Transfers

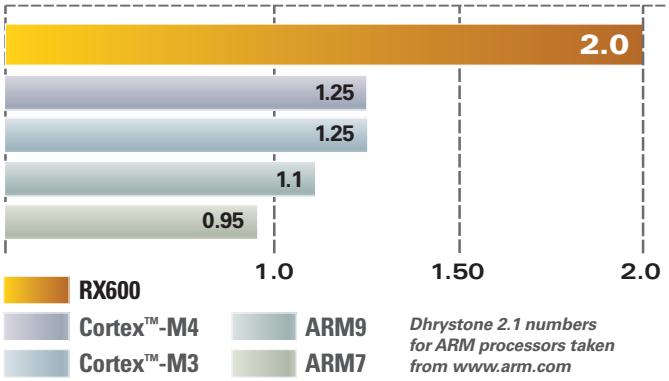
- *Load ADC values into SRAM*
- *Move Ethernet data packets from internal SRAM*
- *Timer data written to DAC output*

Performance

The RX Core delivers up to 2.0 DMIPS per MHz, achieving 480 DMIPS when running up to 240 MHz.

- The new RX71M sets new standards in its class with a 4.39 CoreMark/MHz benchmarks. The results being continually improved with new compiler releases. At the time of printing, the Renesas RX compiler delivers the best RX benchmarks, however please contact Renesas for updated performance figures.

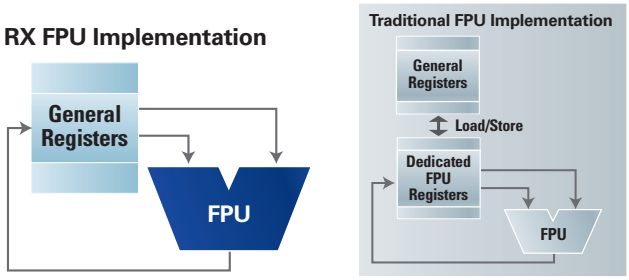
Dhrystone MIPS per MHz
with no wait-state memory access

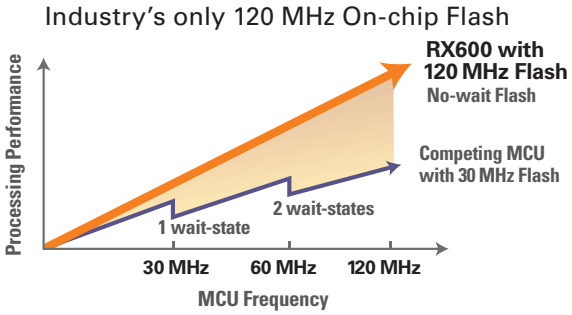


Superior FPU Implementation

The RX FPU implementation allows direct access to general registers, resulting in faster execution and smaller code size.

- RX eliminates the overhead of load/store operations
- Results in higher performance and smaller code size



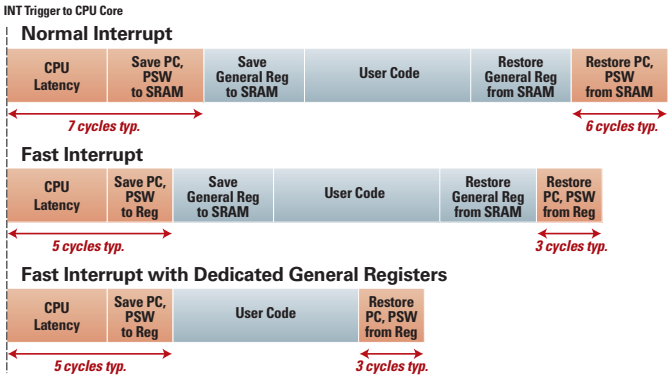


Efficient Interrupt Handling

There are flexible options to achieve minimum latency for various scenarios:

- Normal interrupt responds in as few as seven CPU clock cycles from the event until the firmware serves the interrupt.*
- Fast interrupt mode can be assigned dynamically to any interrupt source, responding in just five CPU clocks, using dedicated registers to save and restore the CPU state.
- All interrupt service routines can be shortened by dedicating up to four RX CPU general registers for use only by interrupts, eliminating the need to push and pop the registers to and from the stack.

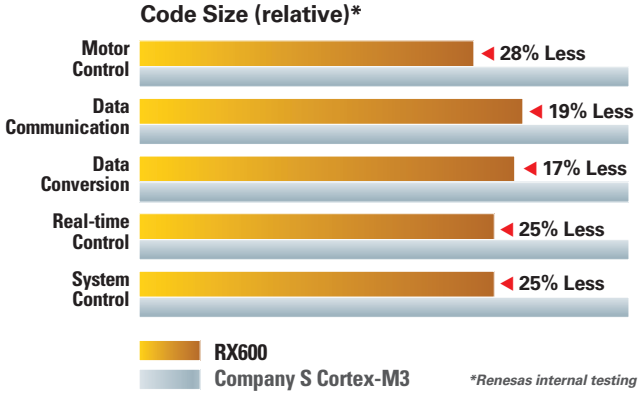
*Interrupt priority judgement cycles not included.



Substantial Code Size Reduction

The RX CISC CPU architecture has inherent advantages over RISC CPUs in terms of code size, with RX's variable length instructions ranging from 8 bits to 64 bits, allowing the compiler to select just the right instruction to do the job.

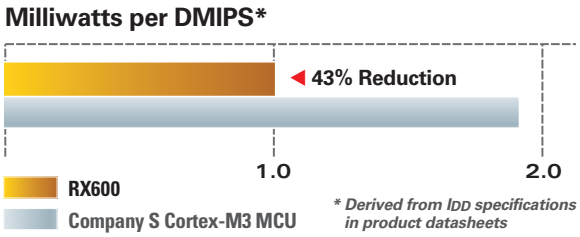
- Many RISC MCUs have only two instruction lengths, 16 bits and 32 bits, so the compiler must make compromises.
- RX CPU supports 10 addressing modes, which optimize manipulation and movement of data.
- Compiled RX code has been measured as much as 28% smaller than the same code compiled on a popular RISC MCU.

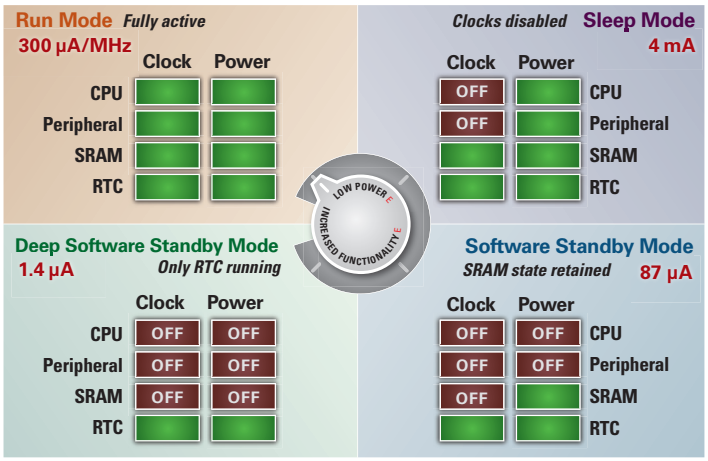


Highly Effective Power Management

Strike an optimized balance of performance and power consumption with many low-power modes of operation enabled by these design techniques:

- Flexible system clocking and gating for each peripheral
- Selective power domain gating for unused sections of the device
- Low-power, high-voltage threshold transistors minimize leakage



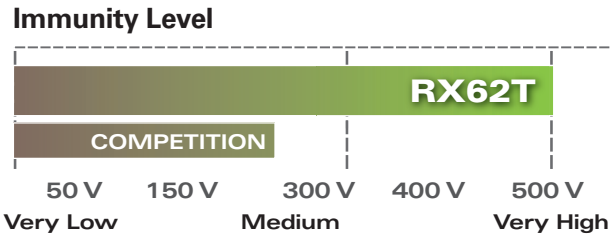


- Compared to a Cortex-M3 based MCU, an RX600 chip enables up to a 43% power reduction – consuming only 1 mW per DMIPS
- The RX Series has four power modes to manage precious battery energy consumption without compromising performance

EMC Advantages – Built-in to Eliminate

Outstanding EMC performance of RX600 MCUs reduces system-integration problems, lowers development costs, and shortens design cycles. BOM costs drop, too, because external components can be eliminated

- Strong electromagnetic immunity boosts system reliability
- Careful VCC and VSS layout
- Noise filters on input signals
- Advanced chip layout techniques



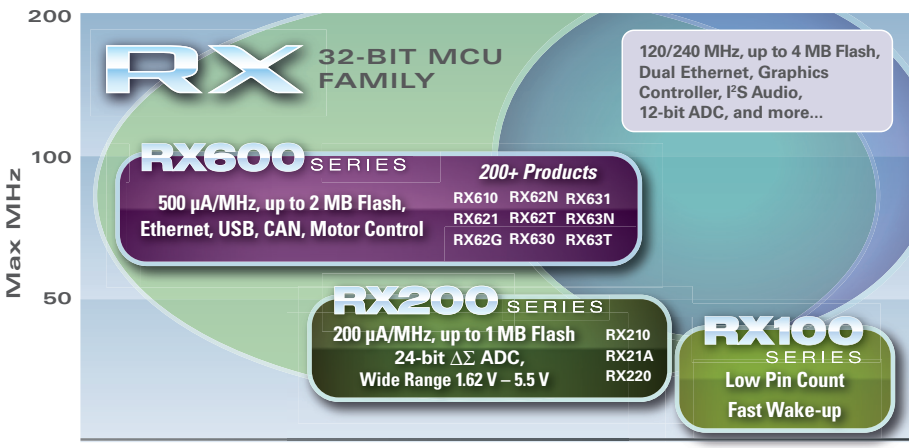
LANGER EMV-Technik

"Langer EMV and Renesas Electronics today announced that the RX600 microcontroller (MCU) family is the most robust MCU Langer EMV has ever tested against environmental noise"

Renesas press release, October 21, 2010

RX Family Product Portfolio

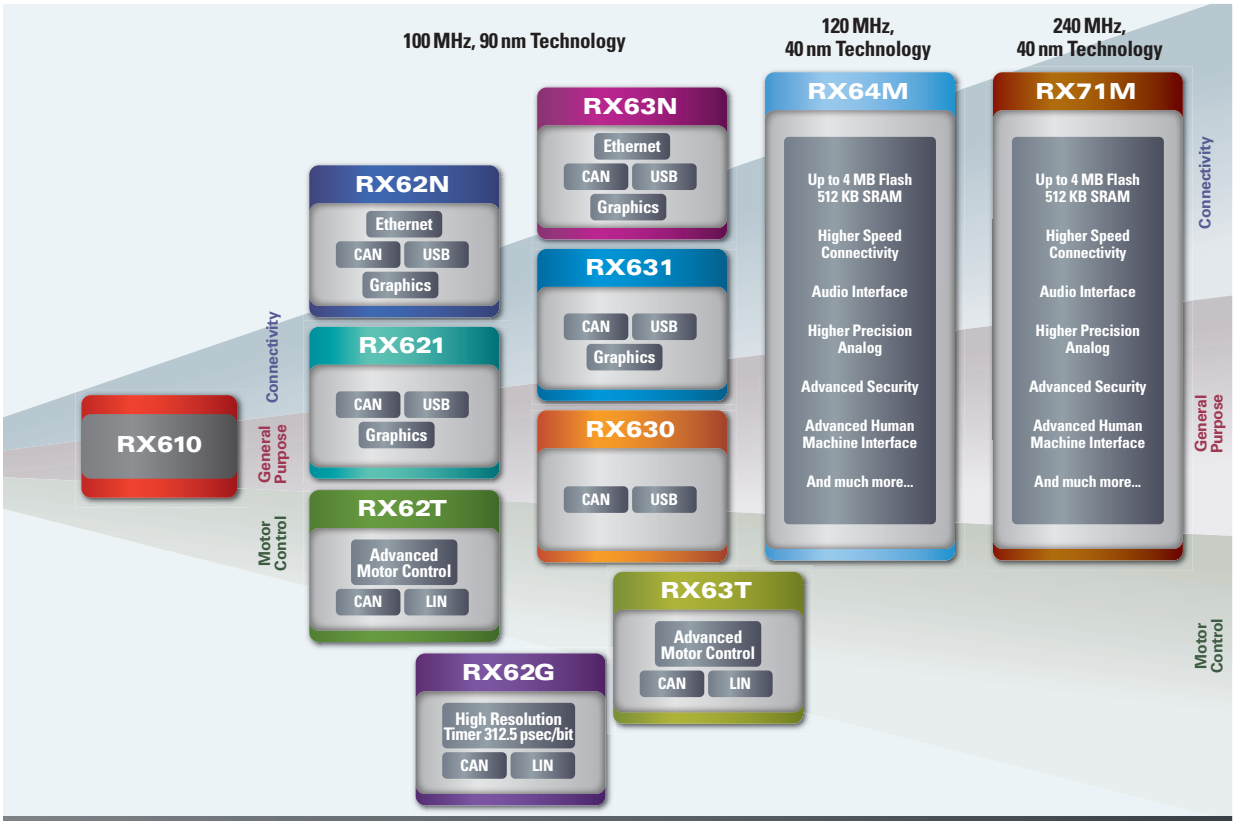
The RX family currently consists of three extensive product series. MCUs in the RX600 series are optimized for applications requiring high-performance, high-efficiency processors. Devices in the RX200 series introduced in 2011 have expanded the range of compatible system-design choices, adding smaller, lower power devices with fewer pins. The latest evolutionary parts of the RX100 series provide the entry level 32-bit performance devices in small packages with USB and lowest power consumption not only in active, but also in RTC mode.



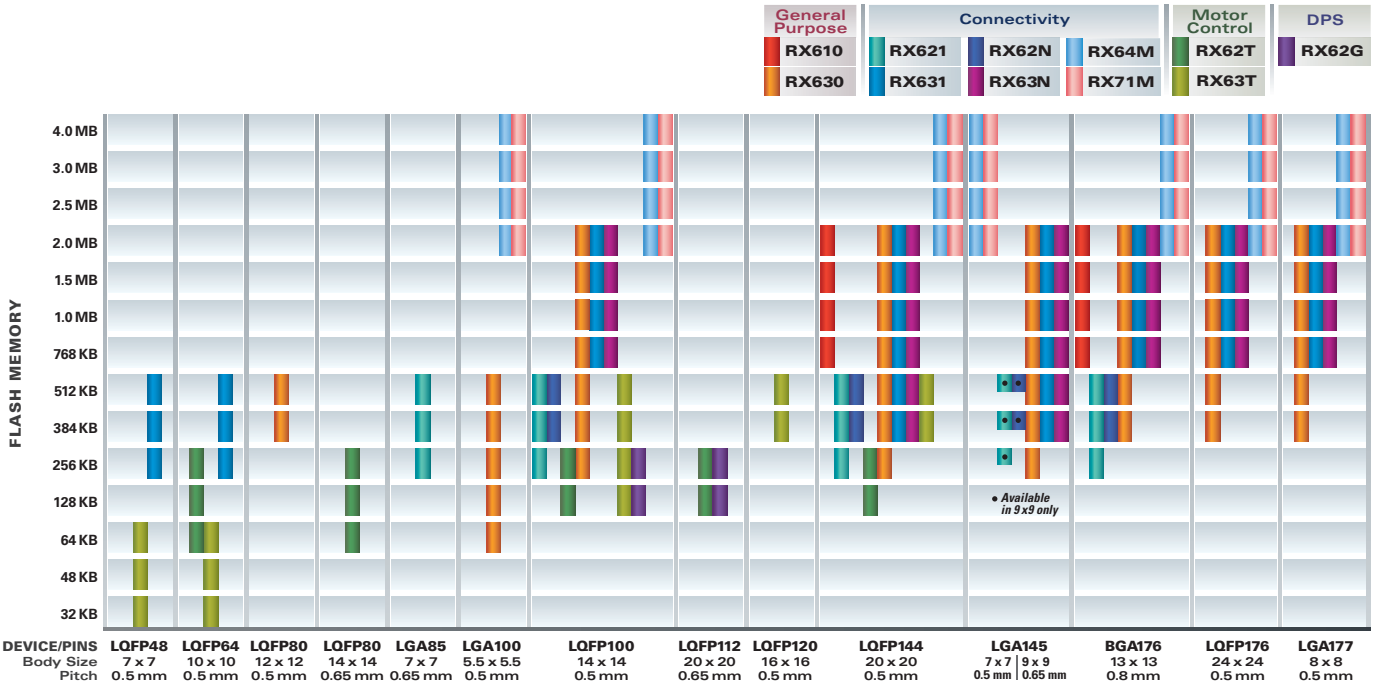
Migration from existing Renesas architectures to RX solutions is easy. And, of course, moving designs

among RX family members is very easy, since RX700, RX600, RX200 and RX100 MCUs share the same CPU architecture and peripherals. This gives system engineers valuable design flexibility and provides substantial head starts on reusing software assets. New products for niche markets can be created quickly and efficiently, as can upgraded or simplified versions of existing products for addressing changes in customer preferences.

RX600 MCU Series Roadmap



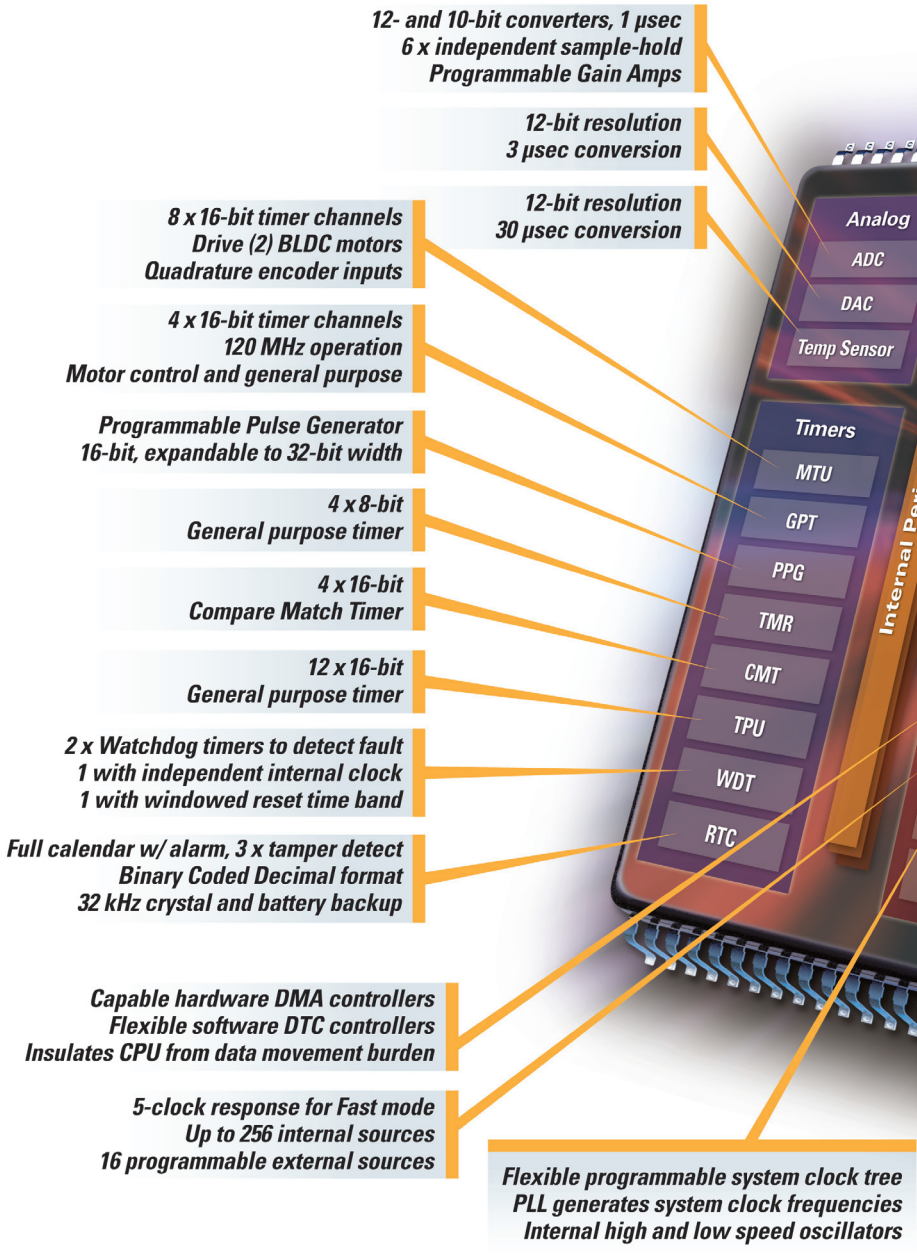
RX600 MCU Series Portfolio



Comprehensive On-chip Peripherals

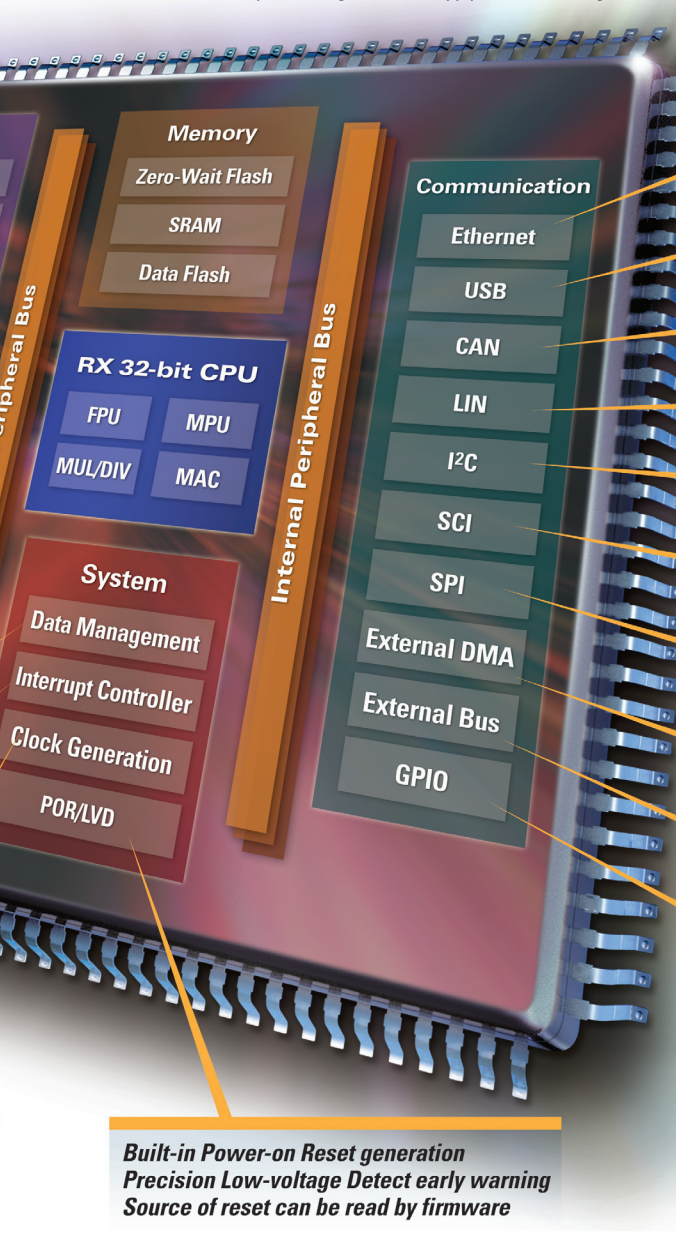
To save cost, simplify system designs, reduce total system power consumption, and enable the implementation of value-added features, a wide range of on-chip peripheral functions is clustered around the powerful CPU core of RX MCUs. Broadly categorized into analog, timer, communication and system functions, these numerous peripherals are proven designs delivering impressive performance. The many different types of RX MCUs offer diverse sets of functions, so chip capabilities and cost can be matched to application needs. The devices in the RX621/62N/630/631/63N/64M/71M and RX62T/63T/62G product groups exemplify this diversity and optimization.

- RX621/62N/631/63N/64M/71M MCUs provide extensive communication peripherals with options for Ethernet, up to three CAN, and up to two USB-FS 2.0 channels (one USB-FS and one USB-HS on the RX71M), each operating as USB Host, USB Device, or USB OTG (On the Go). Additionally, they offer up to thirteen SCI, three SPI, and four I²C serial channels. Among their other peripherals are analog interfaces; timers; RTC and POR/LVD functions; and more.
- RX62T/63T MCUs provide improved motor/inverter control timers and enhanced analog peripherals for implementing very precise motor control and positioning applications. The MTU3 and GPT timer peripherals enable one MCU to control three motors simultaneously. An FPU and improved analog functions make these MCUs ideal for use with three-shunt or single-shunt vector-type motor control methods.
- RX630 MCU provides an fantastic General Purpose feature set making it suitable for many different applications. Communication peripherals with up to 3ch CAN, and USB-FS 2.0 channel operating as USB Device. Additionally, they offer up to thirteen SCI, three SPI and four I2C serial channels. Among their other peripherals are analog interfaces; timers; RTC and POR/LVD functions; and more.
- RX62G MCU provides improved high resolution timer functionality base on the GPT Timer unit, enable to generate a PWM signal with 312.5 psec/bit. An FPU and improved analog functions make these MCUs ideal solution for Digital Power Supply designs, where a High Resolution timer is essential to bring the system design cost down.



		Advanced Peripherals								Basic Peripheral Set																								
		Connectivity				Advanced Motor			Security (Option)	Memory			Analog					Timers								Communication								
	Group	Ethernet 10/100 MAC	USB 2.0 Host/Device/OTG	CAN 2.0B	Graphics ExDMA	Advanced ADC 12-bit	MTU3	GPT	AES	Flash (max)	SRAM (max)	Data Flash	ADC 10-bit	DAC 10-bit	ADC 12-bit	DAC 12-bit	Temperature Sensor	MTU2	TPU	PPG	TMR	CMT	WDT	I-WDT	RTC	I²C	SCI	ExBus	SPI	LIN	SSI	QSPI
Connectivity	RX621	–	2	1	1	–	–	–	–	512 KB	96 KB	32 KB	–	2	8	–	–	12	–	8	4	4	1	1	1	2	6	8/16/32	2	–	–	–
	RX631	–	2	3	1	–	–	–	Yes	2 MB	256 KB	32 KB	8	2	21	–	1	6	12	8	4	4	1	1	1	4	13	8/16/32	3	–	–	–
	RX62N	1	2	1	1	–	–	–	–	512 KB	96 KB	32 KB	–	2	8	–	–	12	–	8	4	4	1	1	1	2	6	8/16/32	2	–	–	–
	RX63N	1	2	3	1	–	–	–	Yes	2 MB	256 KB	32 KB	8	2	21	–	1	6	12	8	4	4	1	1	1	4	13	8/16/32	3	–	–	–
	RX64M	2	2	3	1	–	9	4	Yes	4 MB	512 KB	64 KB	–	–	29	2	1	–	6	8	4	4	1	1	1	2	13	8/16/32	1	–	2	1
	RX71M	2	2****	3	1	–	9	4	Yes	4 MB	512 KB	64 KB	–	–	29	2	1	–	6	8	4	4	1	1	1	2	13	8/16/32	2	–	2	1
General Purpose	RX610	–	–	–	–	–	–	–	–	2 MB	128 KB	32 KB	16	2	–	–	–	–	12	8	4	4	1	–	–	2	7	8/16	–	–	–	–
	RX630	–	1*	3	–	–	–	–	–	2 MB	128 KB	32 KB	8	2	21	–	1	6	12	8	4	4	1	1	1	4	13	8/16/32	3	–	–	–
Motor Control	RX62T	–	–	1	–	8	8	4	–	256 KB	16 KB	8 KB	12	–	–	–	–	–	–	–	–	4	1	1	–	1	3	–	1	1	–	–
	RX63T	–	–	–	–	8	8	4	–	64 KB	8 KB	8 KB	–	–	–	–	–	–	–	–	–	4	1	1	–	1	3	–	1	1	–	–
	RX63TH	–	1	1	–	8	8	8	–	512 KB	48 KB	32 KB	20	2	–	–	–	–	–	–	–	4	1	1	–	2	5	16	2	1	–	–
DPS**	RX62G	–	–	1	–	8	8	4***	–	256 KB	16 KB	8 KB	–	–	–	–	–	–	–	–	–	4	1	1	–	1	3	–	1	1	–	–

* USB device only **Digital Power Supply ***Incl. High Res. Timer ****1x USB Full Speed / 1x USB High Speed



Up to 2 x 10/100 MAC
MII or RMII connection to PHY
2 KB xmit and 2 KB recv buffers

Up to 2 x FS Host, Device, or OTG, 10 x endpoints,
2 KB FIFO, self or bus-powered, on-chip PHY
Up to 1 x HS Host, Device or OTG

Compliant with CAN 2.0B specification
32 x transmit/receive mailboxes
8 x individual acceptance masks

1 x master channel
Baud rate generator

Standard, Fast, and High Speed (1 MHz)
Master, slave, multi-master support
Digital noise filtering

Serial Communications Interface
Synchronous and Asynchronous
UART and 9-bit mode, Smart Card

Master, slave, multi-master support
3-wire or 4-wire operation
Double-buffered 8-bit to 32-bit data length

Transfers data from external to external device
Data movement has minimal load on CPU
Drive colour TFT-LCD with external frame SDRAM/SRAM

8-, 16-, 32-bit CPU data width, 24-bit address
8 x programmable chip select regions
SDRAM support

Programmable configuration at each pin
Options for built-in pull-up and 5 V tolerance
Multiplexed with internal peripheral functions

Built-in Power-on Reset generation
Precision Low-voltage Detect early warning
Source of reset can be read by firmware

RX600 MCU Series Devices 1/8

Device		Memory		Operation		Interfaces								Timers						Clock			Parallel I/F		Analog					Miscellaneous Information					
Group	Part Number	Flash [Byte]	RAM [Byte]	Max. Clock Speed [MHz]	Supply Voltage [V]	I/O	SPI	SCI	I²C	LIN	CAN	USB (Host/Device/OTG)	USB Device	Ethernet	Timer 8-bit	Timer 16-bit	Motor	IWDT	WDT	RTC	LOCO	HOCO	32.768 kHz	TFT LCD	External Data Bus	10-bit ADC	12-bit ADC	10-bit DAC	ProgOpAmp	POR & LVD	Security	DMA	DTC	Packages	Qualification	Other Features
RX610	R5F56107WDBG	1536k + 32k	128k	100	3.0 – 3.6 V	140	7	7	2	–	–	–	–	–	4	22	–	–	1		–	–	–	–	Yes	4x 4ch	–	2ch	–	–	–	4	Yes	BGA 176-pin 13 x 13 mm 0.8 mm pitch	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; Programmable Pattern Generator (PPG)
	R5F56106WDBG	1024k + 32k																																	
	R5F56104WDBG	768k + 32k																																	
	R5F56108VDFP	2048k + 32k				117																												LQFP 144-pin 20 x 20 mm 0.5 mm pitch		
	R5F56107VDFP	1536k + 32k																																	
	R5F56106VDFP	1024k + 32k																																	
	R5F56104VDFP	768k + 32k																																	
	R5F56104VDFP	768k + 32k																																	
RX621	R5F56218BDBG	512k + 32k	96k	100	2.7 – 3.6 V	128	2	6	2	–	1	2	–	–	4	16	MTU2	1	1	1	1	-	Yes	Yes	SDRAM	2x 4ch or	or 8ch	2ch	–	Yes	–	4	Yes	BGA 176-pin 13 x 13 mm 0.8 mm pitch	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; SDRAM Interface; Programmable Pattern Generator (PPG), RTC, CRC Unit
	R5F56217BDBG	384k + 32k	64k																																
	R5F56216BDBG	256k + 32k																																	
	R5F56218BDLE	512k + 32k	96k			105						1																						LGA 145-pin 9 x 9 mm 0.65 mm pitch		
	R5F56217BDLE	384k + 32k	64k																																
	R5F56216BDLE	256k + 32k																																	
	R5F56218BDFB	512k + 32k	96k			105																												LQFP 144-pin 20 x 20 mm 0.5 mm pitch		
	R5F56217BDFB	384k + 32k	64k																																
	R5F56216BDFB	256k + 32k																																	
	R5F56218BDFP	512k + 32k	96k			74	2	6	1	–														–	Yes								LQFP 100-pin 14 x 14 mm 0.5 mm pitch		FPU; DSP RMPA; Barrel Shifter; Programmable Pattern Generator (PPG), RTC, CRC unit
	R5F56217BDFP	384k + 32k	64k																																
	R5F56216BDFP	256k + 32k																																	
	R5F56218BDLD	512k + 32k	96k			60																												LGA 85-pin 7 x 7 mm 0.65 mm pitch		
	R5F56217BDLD	384k + 32k	64k																																
	R5F56216BDLD	256k + 32k																																	
RX62N	R5F562N8BDBG	512k + 32k	96k	100	2.7 – 3.6 V	128	2	6	2	–	1	2	–	Yes	4	16	MTU2	1	1	1	1	–	Yes	Yes	SDRAM	2x 4ch or	or 8ch	2ch	–	Yes	–	1	Yes	BGA 176-pin 13 x 13 mm 0.8 mm pitch	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; SDRAM Interface; Programmable Pattern Generator (PPG), RTC, Ethernet DMA, CRC Unit
	R5F562N8ADBG	512k + 32k									–																								
	R5F562N7BDBG	384k + 32k	64k								1																								
	R5F562N7ADBG	384k + 32k									–																								
	R5F562N8BDLE	512k + 32k	96k			105					1																							LGA 145-pin 9 x 9 mm 0.65 mm pitch		
	R5F562N8ADLE	512k + 32k									–																								
	R5F562N7BDLE	384k + 32k	64k								1																								
	R5F562N7ADLE	384k + 32k									–																								
	R5F562N8BDFB	512k + 32k	96k			105					1																							LQFP 144-pin 20 x 20 mm 0.5 mm pitch		
	R5F562N8ADFB	512k + 32k									–																								
	R5F562N7BDFB	384k + 32k	64k								1																								
	R5F562N7ADFB	384k + 32k									–																								
	R5F562N8BDFP	512k + 32k	96k			74	2	6	1	–	1													–	Yes								LQFP 100-pin 14 x 14 mm 0.5 mm pitch		FPU; DSP RMPA; Barrel Shifter; Programmable Pattern Generator (PPG), RTC, Ethernet DMA, CRC Unit
	R5F562N8ADFP	512k + 32k									–																								
	R5F562N7BDFP	384k + 32k	64k								1																								
	R5F562N7ADFP	384k + 32k									–																								
RX62G	R5F562GAADFH	256k + 32k	16k	100	4.0 – 5.5 V	82	1	3	1	1	1	–	–	–	–	14	MTU3 and GPT	1	1	–	1	–	–	–	–	12ch	2x 4ch	–	6	Yes		-	Yes	LQFP 112-pin 20 x 20 mm 0.65 mm pitch	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; External Input (POE) Windows Comparator; Clock Stop Detection; Clock Monitoring; ADC Diagnostic, CRC Unit; High Resolution Timer with 312.5 psec/bit
	R5F562GADDFH	256k + 32k									–																								
	R5F562G7ADFH	128k + 8k	8k								1																								
	R5F562G7DDFH	128k + 8k									–																								
	R5F562GAADFP	256k + 32k	16k			76					1																							LQFP 100-pin 14 x 14 mm 0.5 mm pitch		
	R5F562GADDFP	256k + 32k									–																								
	R5F562G7ADFP	128k + 8k	8k								1																								
	R5F562G7DDFP	128k + 8k																																	

RX600 MCU Series Devices 2/8

Device		Memory		Operation		Interfaces										Timers						Clock			Parallel I/F		Analog					Miscellaneous Information					
Group	Part Number	Flash [Byte]	RAM [Byte]	Max. Clock Speed [MHz]	Supply Voltage [V]	I/O	SPI	SCI	I²C	LIN	CAN	USB (Host/Device/OTG)	USB Device	Ethernet	Timer 8-bit	Timer 16-bit	Motor	IWDT	WDT	RTC	LOCO	HOCO	32.768 kHz	TFT LCD	External Data Bus	10-bit ADC	12-bit ADC	10-bit DAC	ProgOpAmp	POR & LVD	Security	DMA	DTC	Packages	Qualification	Others features
RX62T	R5F562TABDFH	256k + 32k	16k	100	2.7 – 3.6 V	82	1	3	1	1	1	–	–	–	–	14	MTU3 and GPT	1	1	–	1	–	–	–	–	12ch	2x 4ch	–	6	Yes	–	–	Yes	LQFP 112-pin 20 x 20mm 0.65 mm pitch	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; External Input (POE) Windows Comparator; Clock Stop Detection; Clock Monitoring; ADC Diagnostic; CRC Unit
	R5F562TAADFH	256k + 32k			4.0 – 5.5 V						1																									
	R5F562TAEDFH	256k + 32k			2.7 – 3.6 V						–																									
	R5F562TADDFH	256k + 32k			4.0 – 5.5 V						–																									
	R5F562T7BDFH	128k + 8k	8k		2.7 – 3.6 V						1																									
	R5F562T7ADFH	128k + 8k			4.0 – 5.5 V						1																									
	R5F562T7EDFH	128k + 8k			2.7 – 3.6 V						–																									
	R5F562T7DDFH	128k + 8k			4.0 – 5.5 V						–																									
	R5F562TABDFP	256k + 32k	16k		2.7 – 3.6 V	76					1				–	14										12ch	2x 4ch							LQFP 100-pin 14 x 14 mm 0.5 mm pitch		
	R5F562TAADFP	256k + 32k			4.0 – 5.5 V						1																									
	R5F562TAEDFP	256k + 32k			2.7 – 3.6 V						–																									
	R5F562TADDFP	256k + 32k			4.0 – 5.5 V						–																									
	R5F562T7BDFP	128k + 8k	8k		2.7 – 3.6 V						1																									
	R5F562T7ADFP	128k + 8k			4.0 – 5.5 V						1																									
	R5F562T7EDFP	128k + 8k			2.7 – 3.6 V						–																									
	R5F562T7DDFP	128k + 8k			4.0 – 5.5 V						–																									
	R5F562TABDFF	256k + 32k	16k		2.7 – 3.6 V	57					1				–	10										4ch	2x 4ch							LQFP 80-pin 14 x 14mm 0.65 mm pitch		
	R5F562TAADFF	256k + 32k			4.0 – 5.5 V						1																									
	R5F562TAEDFF	256k + 32k			2.7 – 3.6 V						–																									
	R5F562TADDFF	256k + 32k			4.0 – 5.5 V						–																									
	R5F562T7BDFF	128k + 8k	8k		2.7-3.6 V						1																									
	R5F562T7ADFF	128k + 8k			4.0 – 5.5 V						1																									
	R5F562T7EDFF	128k + 8k			2.7 – 3.6 V						–																									
	R5F562T7DDFF	128k + 8k			4.0 – 5.5 V						–																									
	R5F562T6BDFF	64k + 8k			2.7 – 3.6 V						1																									
	R5F562T6ADFF	64k + 8k			4.0 – 5.5 V						1																									
	R5F562T6EDFF	64k + 8k			2.7 – 3.6 V						–																									
	R5F562T6DDFF	64k + 8k			4.0 – 5.5 V						–																									
	R5F562TABDFM	256k + 32k	16k		2.7 – 3.6 V	57					1				–	10										–	2x 4ch							LQFP 64-pin 10 x 10mm 0.5 mm pitch		
	R5F562TAADFM	256k + 32k			4.0 – 5.5 V						1																									
	R5F562TAEDFM	256k + 32k			2.7 – 3.6 V						–																									
	R5F562TADDFM	256k + 32k			4.0 – 5.5 V						–																									
	R5F562T7BDFM	128k + 8k	8k		2.7 – 3.6 V						1																									
	R5F562T7ADFM	128k + 8k			4.0 – 5.5 V						1																									
	R5F562T7EDFM	128k + 8k			2.7 – 3.6 V						–																									
	R5F562T7DDFM	128k + 8k			4.0 – 5.5 V						–																									
	R5F562T6BDFM	64k + 8k			2.7 – 3.6 V						1																									
	R5F562T6ADFM	64k + 8k			4.0 – 5.5 V						1																									
	R5F562T6EDFM	64k + 8k			2.7 – 3.6 V						–																									
	R5F562T6DDFM	64k + 8k			4.0 – 5.5 V						–																									
	R5F562TABDFK	256k + 32k	16k		2.7 – 3.6 V	46					1				–	10										–	2x 4ch							LQFP 64-pin 14 x 14mm 0.8 mm pitch		
	R5F562TAADFK	256k + 32k			4.0 – 5.5 V						1																									
	R5F562TAEDFK	256k + 32k			2.7 – 3.6 V						–																									
	R5F562TADDFK	256k + 32k			4.0 – 5.5 V						–																									
	R5F562T7BDFK	128k + 8k	8k		2.7 – 3.6 V						1																									
	R5F562T7ADFK	128k + 8k			4.0 – 5.5 V						1																									
	R5F562T7EDFK	128k + 8k			2.7 – 3.6 V						–																									
	R5F562T7DDFK	128k + 8k			4.0 – 5.5 V						–																									
	R5F562T6BDFK	64k + 8k			2.7 – 3.6 V						1																									
	R5F562T6ADFK	64k + 8k			4.0 – 5.5 V						1																									
	R5F562T6EDFK	64k + 8k			2.7 – 3.6 V						–																									
	R5F562T6DDFK	64k + 8k			4.0 – 5.5 V						–																									

RX600 MCU Series Devices 3/8

Device		Memory		Operation		Interfaces								Timers						Clock			Parallel I/F		Analog					Miscellaneous Information					
Group	Part Number	Flash [Byte]	RAM [Byte]	Max. Clock Speed [MHz]	Supply Voltage [V]	I/O	SPI	SCI	I²C	LIN	CAN	USB (Host/Device/OTG)	USB Device	Ethernet	Timer 8-bit	Timer 16-bit	Motor	IWDT	WDT	RTC	LOCO	HOCO	32.768 kHz	TFT LCD	External Data Bus	10-bit ADC	12-bit ADC	10-bit DAC	ProgOpAmp	POR & LVD	Security	DMA	DTC	Packages	Qualification	Others features
RX630	R5F5630EDDFC	2048k + 32k	128k	100	2.7 – 3.6 V	133	3	13	4	–	3	–	1	–	4	22	MTU2	1	1	1 Vbat Anti Tamper	1	1	Yes	–	Yes	8ch	21ch	2ch	–	Yes	–	4	Yes	LQFP 176-pin 24 x 24 mm 0.5 mm	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; Programmable Pattern Generator (PPG); RTC with Vbat; CRC Unit; Temperature Sensor
	R5F5630DDDFC	1536k + 32k																																	
	R5F5630BDDFC	1024k + 32k	96k								2																								
	R5F5630ADDFC	768k + 32k																																	
	R5F56308DDFC	512k + 32k	64k								1																								
	R5F5630EDDBG	2048k + 32k	128k			133					3																							BGA 176-pin 13 x 13mm 0.8 mm		
	R5F5630DDDBG	1536k + 32k																																	
	R5F5630BDDBG	1024k + 32k	96k								2																								
	R5F5630ADDBG	768k + 32k																																	
	R5F56308DDBG	512k + 32k	64k								1																								
	R5F56307DDBG	384k + 32k																																	
	R5F5630EDDLK	2048k + 32k	128k			111					3																							LGA 145-pin 7 x 7 mm 0.5 mm		
	R5F5630DDDLK	1536k + 32k																																	
	R5F5630BDDLK	1024k + 32k	96k								2																								
	R5F5630ADDLK	768k + 32k																																	
	R5F56308DDLK	512k + 32k	64k								1																								
	R5F56307DDLK	384k + 32k																																	
	R5F5630EDDFB	2048k + 32k	128k			111					3																							LQFP 144-pin 20 x 20 mm 0.5 mm		
	R5F5630DDDFB	1536k + 32k																																	
	R5F5630BDDFB	1024k + 32k	96k								2																								
	R5F5630ADDFB	768k + 32k																																	
	R5F56308DDFB	512k + 32k	64k								1																								
	R5F56307DDFB	384k + 32k																																	
	R5F5630EDDLA	2048k + 32k	128k			78	2	3	2		2					16											14ch	1ch						LGA 100-pin 5.5 x 5.5 mm 0.5 mm		
	R5F5630DDDLA	1536k + 32k																																	
	R5F5630BDDLA	1024k + 32k	96k																																
	R5F5630ADDLA	768k + 32k																																	
	R5F56308DDLA	512k + 32k	64k								1																								
	R5F56307DDLA	384k + 32k																																	
	R5F5630EDDFP	2048k + 32k	128k								2																							LQFP 100-pin 14 x 14 mm 0.5 mm		
	R5F5630DDDFP	1536k + 32k																																	
	R5F5630BDDFP	1024k + 32k	96k																																
	R5F5630ADDFP	768k + 32k																																	
	R5F56308DDFP	512k + 32k	64k								1																								
	R5F56307DDFP	384k + 32k																																	
	R5F56306DDFP	256k + 32k	48k																																
	R5F56308DDFN	512k + 32k	64k			58	2	6	2		1					16									–	4ch	10ch						LQFP 80-pin 12 x 12 mm 0.5 mm		
	R5F56307DDFN	384k + 32k																																	
RX63T	R5F563TEBDFB	512k + 32k	48k	100	2.7 – 3.6 V	110	2	5	2	–	1	1	–	–	–	14	MTU3 and GPT	1	1	–	1	–	–	–	Yes	20ch	2 x 4ch	2ch	6	Yes	–	4	Yes	LQFP 144-pin 20 x 20 mm 0.5 mm pitch	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; External Input (POE) Windows Comparator; Clock Stop Detection; Clock Monitoring; ADC Diagnostic; CRC Unit
	R5F563TEADFB	512k + 32k			4.0 – 5.5 V						1																								
	R5F563TEEDFB	512k + 32k			2.7 – 3.6 V						–																								
	R5F563TEDDFB	512k + 32k			4.0 – 5.5 V						–																								
	R5F563TCBDFB	384k + 32k	32k		2.7 – 3.6 V						1																								
	R5F563TCADFB	384k + 32k			4.0 – 5.5 V						1																								
	R5F563TCEDFB	384k + 32k			2.7 – 3.6 V						–																								
	R5F563TCDDFB	384k + 32k			4.0 – 5.5 V						–																								

RX600 MCU Series Devices 4/8

Device		Memory		Operation		Interfaces								Timers						Clock			Parallel I/F		Analog					Miscellaneous Information					
Group	Part Number	Flash [Byte]	RAM [Byte]	Max. Clock Speed [MHz]	Supply Voltage [V]	I/O	SPI	SCI	I²C	LIN	CAN	USB (Host/Device/OTG)	USB Device	Ethernet	Timer 8-bit	Timer 16-bit	Motor	IWDT	WDT	RTC	LOCO	HOCO	32.768 kHz	TFT LCD	External Data Bus	10-bit ADC	12-bit ADC	10-bit DAC	ProgOpAmp	POR & LVD	Security	DMA	DTC	Packages	Qualification	Others features
RX63T	R5F563TBBDFB	256k + 32k	48k	100	2.7 – 3.6V	110	2	5	2	–	1	1	–	–	–	14	MTU3 and GPT	1	1	–	1	–	–	–	Yes	20ch	2 x 4ch	2ch	6	Yes	–	4	Yes	LQFP 144-pin 20 x 20 mm 0.5 mm pitch	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; External Input (POE) Windows Comparator; Clock Stop Detection; Clock Monitoring; ADC Diagnostic; CRC Unit
	R5F563TBADFB	256k + 32k			4.0 – 5.5V						1																								
	R5F563TBEDFB	256k + 32k			2.7 – 3.6V						–																								
	R5F563TBDDFB	256k + 32k			4.0 – 5.5V						–																								
	R5F563TEBDFA	512k + 32k	32k		2.7 – 3.6V	93					1															12ch								LQFP 120-pin 16 x 16 mm 0.5 mm pitch		
	R5F563TEADFA	512k + 32k			4.0 – 5.5V						1																								
	R5F563TEEDFA	512k + 32k			2.7 – 3.6V						–																								
	R5F563TEDDFA	512k + 32k			4.0 – 5.5V						–																								
	R5F563TCBDFA	384k + 32k	32k		2.7 – 3.6V						1																								
	R5F563TCADFA	384k + 32k			4.0 – 5.5V						1																								
	R5F563TCEDFA	384k + 32k			2.7 – 3.6V						–																								
	R5F563TCDDFA	384k + 32k			4.0 – 5.5V						–																								
	R5F563TBBDFA	256k + 32k	24k		2.7 – 3.6V						1																								
	R5F563TBADFA	256k + 32k			4.0 – 5.5V						1																								
	R5F563TBEDFA	256k + 32k			2.7 – 3.6V						–																								
	R5F563TBDDFA	256k + 32k			4.0 – 5.5V						–																								
	R5F563TEBDFH	512k + 32k	48k		2.7 – 3.6V	90					1															12ch								LQFP 112-pin 20 x 20 mm 0.65 mm pitch		
	R5F563TEADFH	512k + 32k			4.0 – 5.5V						1																								
	R5F563TEEDFH	512k + 32k			2.7 – 3.6V						–																								
	R5F563TEDDFH	512k + 32k			4.0 – 5.5V						–																								
	R5F563TCBDFH	384k + 32k	32k		2.7 – 3.6V						1																								
	R5F563TCADFH	384k + 32k			4.0 – 5.5V						1																								
	R5F563TCEDFH	384k + 32k			2.7 – 3.6V						–																								
	R5F563TCDDFH	384k + 32k			4.0 – 5.5V						–																								
	R5F563TBBDFH	256k + 32k	24k		2.7 – 3.6V						1																								
	R5F563TBADFH	256k + 32k			4.0 – 5.5V						1																								
	R5F563TBEDFH	256k + 32k			2.7 – 3.6V						–																								
	R5F563TBDDFH	256k + 32k			4.0 – 5.5V						–																								
	R5F563TEBDFP	512k + 32k	48k		2.7 – 3.6V	78		4	1		1																								
	R5F563TEADFP	512k + 32k			4.0 – 5.5V						1																								
	R5F563TEEDFP	512k + 32k			2.7 – 3.6V						–																								
	R5F563TEDDFP	512k + 32k			4.0 – 5.5V						–																								
	R5F563TCBDFP	384k + 32k	32k		2.7 – 3.6V						1																								
	R5F563TCADFP	384k + 32k			4.0 – 5.5V						1																								
	R5F563TCADFP	384k + 32k			2.7 – 3.6V						–																								
	R5F563TCADFP	384k + 32k			4.0 – 5.5V						–																								
	R5F563TCADFP	256k + 32k	24k		2.7 – 3.6V						1																								
	R5F563TCADFP	256k + 32k			4.0 – 5.5V						1																								
	R5F563TCADFP	256k + 32k			2.7 – 3.6V						–																								
	R5F563TCADFP	256k + 32k			4.0 – 5.5V						–																								
	R5F563T6EDFM	64k + 8k	8k		2.7 – 3.6V	48	1	3	1	–	–	–	–	–	–	16	–	–	–	–	–	–	–	–	–	–	8ch	–	–	–	–	–	–	LQFP 64-pin 10 x 10 mm 0.5 mm pitch		
	R5F563T5EDFM	48k + 8k																																	
	R5F563T4EDFM	32k + 8k																																	
	R5F563T6EDFM	64k + 8k				32																					6ch							LQFP 48-pin 7 x 7 mm 0.5 mm pitch		
	R5F563T5EDFM	48k + 8k																																	
	R5F563T4EDFM	32k + 8k																																	

RX600 MCU Series Devices 5/8

Device		Memory		Operation		Interfaces									Timers						Clock			Parallel I/F		Analog					Miscellaneous Information					
Group	Part Number	Flash [Byte]	RAM [Byte]	Max. Clock Speed [MHz]	Supply Voltage [V]	I/O	SPI	SCI	I²C	LIN	CAN	USB (Host/Device/OTG)	USB Device	Ethernet	Timer 8-bit	Timer 16-bit	Motor	IWDT	WDT	RTC	LOCO	HOCO	32.768 kHz	TFT LCD	External Data Bus	10-bit ADC	12-bit ADC	10-bit DAC	ProgOpAmp	POR & LVD	Security	DMA	DTC	Packages	Qualification	Others features
RX631	R5F5631EDDLC	2048k + 32k	128k	100	2.7 – 3.6 V	133	3	13	4	–	3	2	–	–	4	22	MTU2	1	1	1 Vbat Anti Tamper	1	1	Yes	Yes	SDRAM	8ch	21ch	2ch	–	Yes	–	4	Yes	LGA 177-pin 8 x 8 mm 0.5 mm	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; SDRAM Interface; Programmable Pattern Generator (PPG); RTC with Vbat (177 – 64-pin); CRC Unit; Temperature Sensor
	R5F5631DDDLC	1536k + 32k																																		
	R5F5631BDDLC	1024k + 32k																																		
	R5F5631ADDLC	768k + 32k																																		
	R5F56318DDLC	512k + 32k	128k																																	
	R5F56317DDLC	384k + 32k																																		
	R5F56316DDLC	256k + 32k																																		
	R5F5631EDDFC	2048k + 32k	128k																															LQFP 176-pin 24 x 24 mm 0.5 mm		
	R5F5631DDDFC	1536k + 32k																																		
	R5F5631BDDFC	1024k + 32k																																		
	R5F5631ADDFC	768k + 32k																																		
	R5F56318DDFC	512k + 32k	128k																																	
	R5F56317DDFC	384k + 32k																																		
	R5F56316DDFC	256k + 32k																																		
	R5F5631FHDFC	2048k + 32k	256k																												AES					
	R5F5631JHDFC	1536k + 32k																																		
	R5F5631YHDFC	1024k + 32k																																		
	R5F5631KHDFC	2048k + 32k	192k																																	
	R5F5631GHDFC	1536k + 32k																																		
	R5F5631WHDFC	1024k + 32k																																		
	R5F5631FDDFC	2048k + 32k	256k																																	
	R5F5631JDDFC	1536k + 32k																																		
	R5F5631YDDFC	1024k + 32k																																		
	R5F5631KDDFC	2048k + 32k	192k																																	
	R5F5631GDDFC	1536k + 32k																																		
	R5F5631WDDFC	1024k + 32k																																		
	R5F5631EDDBG	2048k + 32k	128k																															BGA 176-pin 13 x 13 mm 0.8 mm		
	R5F5631DDDBG	1536k + 32k																																		
	R5F5631BDDBG	1024k + 32k																																		
	R5F5631ADDBG	768k + 32k																																		
	R5F56318DDBG	512k + 32k	128k																																	
	R5F56317DDBG	384k + 32k																																		
	R5F56316DDBG	256k + 32k																																		
	R5F5631EDDLK	2048k + 32k	128k			111						1																			–			LGA 145-pin 7 x 7 mm 0.5 mm		
	R5F5631DDDLK	1536k + 32k																																		
	R5F5631BDDLK	1024k + 32k																																		
	R5F5631ADDLK	768k + 32k																																		
	R5F56318DDLK	512k + 32k	128k																																	
	R5F56317DDLK	384k + 32k																																		
	R5F56316DDLK	256k + 32k																																		
	R5F5631EDDFB	2048k + 32k	128k																															LQFP 144-pin 20 x 20 mm 0.5 mm		
	R5F5631DDDFB	1536k + 32k																																		
	R5F5631BDDFB	1024k + 32k																																		
	R5F5631ADDFB	768k + 32k																																		
	R5F56318DDFB	512k + 32k	128k																																	
	R5F56317DDFB	384k + 32k																																		
	R5F56316DDFB	256k + 32k																																		

RX600 MCU Series Devices 6/8

Device		Memory		Operation		Interfaces								Timers						Clock			Parallel I/F		Analog				Miscellaneous Information					
Group	Part Number	Flash [Byte]	RAM [Byte]	Max. Clock Speed [MHz]	Supply Voltage [V]	I/O	SPI	SCI	I²C	LIN	CAN	USB (Host/Device/OTG)	USB Device	Ethernet	Timer 8-bit	Timer 16-bit	Motor	IWDT	WDT	RTC	LOCO	HOCO	32.768 kHz	TFT LCD	External Data Bus	10-bit ADC	12-bit ADC	10-bit DAC	ProgOpAmp	POR & LVD	Security	DMA	DTC	Packages	Qualification	Others features
RX631	R5F5631FHDFB	2048 k + 32 k	256k	100	2.7 – 3.6 V	111	3	13	4		3					22									SDRAM		21ch				AES			LQFP 144-pin 20 × 20 mm 0.5 mm	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; SDRAM Interface; Programmable Pattern Generator (PPG); RTC with Vbat (177 – 64-pin); CRC Unit; Temperature Sensor
	R5F5631JHDFB	1536 k + 32 k																																
	R5F5631YHDFB	1024 k + 32 k																																
	R5F5631KHDFB	2048 k + 32 k	192k																															
	R5F5631GHDFB	1536 k + 32 k																																
	R5F5631WHDFB	1024 k + 32 k																																
	R5F5631FDDFB	2048 k + 32 k	256k																															
	R5F5631JDDFB	1536 k + 32 k																																
	R5F5631YDDFB	1024 k + 32 k																																
	R5F5631KDDFB	2048 k + 32 k	192k																															
	R5F5631GDDFB	1536 k + 32 k																																
	R5F5631WDDFB	1024 k + 32 k																																
	R5F5631EDDFJ	2048 k + 32 k	128k			78	2	9	2	–	2	1	–	–	4	16	MTU2	1	1	1 Vbat Anti Tamper	1	1	Yes	Yes	Yes	8ch	14ch	2ch	–	Yes	–	4	Yes	LGA 100-pin 7 × 7 mm 0.65 mm		
	R5F5631DDDFJ	1536 k + 32 k																																
	R5F5631BDDFJ	1024 k + 32 k																																
	R5F5631ADDFJ	768 k + 32 k																																
	R5F56318DDFJ	512 k + 32 k	128k																															
	R5F56317DDFJ	384 k + 32 k																																
	R5F56316DDFJ	256 k + 32 k																																
	R5F5631EDDFP	2048 k + 32 k	128k																															
	R5F5631DDDFP	1536 k + 32 k																																
	R5F5631BDDFP	1024 k + 32 k																																
	R5F5631ADDFP	768 k + 32 k																																
	R5F56318DDFP	512 k + 32 k	128k																															
	R5F56317DDFP	384 k + 32 k																																
	R5F56316DDFP	256 k + 32 k																																
	R5F5631FHDFP	2048 k + 32 k	256k																															
	R5F5631JHDFP	1536 k + 32 k																																
	R5F5631YHDFP	1024 k + 32 k																																
	R5F5631KHDFP	2048 k + 32 k	192k																															
	R5F5631GHDFP	1536 k + 32 k																																
	R5F5631WHDFP	1024 k + 32 k																																
	R5F5631FDDFP	2048 k + 32 k	256k																															
	R5F5631JDDFP	1536 k + 32 k																																
	R5F5631YDDFP	1024 k + 32 k																																
	R5F5631KDDFP	2048 k + 32 k	192k																															
	R5F5631GDDFP	1536 k + 32 k																																
	R5F5631WDDFP	1024 k + 32 k																																
	R5F5631PDDFM	512 k + 32 k	64k			42		6	1		1													–	–	–	12ch	1ch			–			LQFP 64-pin 10 × 10 mm 0.5 mm		
	R5F5631NDDFM	384 k + 32 k																																
	R5F5631MDDFM	256 k + 32 k																																
	R5F5631PDDFL	512 k + 32 k	64k			30																					8ch	–					LQFP 48-pin 7 × 7 mm 0.5 mm		
	R5F5631NDDFL	384 k + 32 k																																
	R5F5631MDDFL	256 k + 32 k																																

RX600 MCU Series Devices 7/8

Device		Memory		Operation		Interfaces								Timers						Clock			Parallel I/F		Analog					Miscellaneous Information					
Group	Part Number	Flash [Byte]	RAM [Byte]	Max. Clock Speed [MHz]	Supply Voltage [V]	I/O	SPI	SCI	I²C	LIN	CAN	USB (Host/Device/OTG)	USB Device	Ethernet	Timer 8-bit	Timer 16-bit	Motor	IWDT	WDT	RTC	LOCO	HOCO	32.768 kHz	TFT LCD	External Data Bus	10-bit ADC	12-bit ADC	10-bit DAC	ProgOpAmp	POR & LVD	Security	DMA	DTC	Packages	Qualification	Others features
RX63N	R5F563NEDDLC	2048k + 32k	128k	100	2.7 – 3.6 V	133	2	13	4	–	3	2	–	1	4	22	MTU2	1	1	1 Vbat Anti Tamper	1	1	Yes	Yes	SDRAM	8ch	21ch	2ch	–	Yes	–	4	Yes	LGA 177-pin 8 x 8 mm 0.5 mm	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; SDRAM Interface; Programmable Pattern Generator (PPG); RTC with Vbat; Ethernet DMA; CRC Unit, Temperature Sensor
	R5F563NDDDLC	1536k + 32k																																	
	R5F563NBDDLC	1024k + 32k																																	
	R5F563NADDLC	768k + 32k																																	
	R5F563NEDDFC	2048k + 32k	128k																																
	R5F563NDDDFC	1536k + 32k																																	
	R5F563NBDDFC	1024k + 32k																																	
	R5F563NADDFC	768k + 32k																																	
	R5F563NFHDFC	2048k + 32k	256k																												AES				
	R5F563NJHDFC	1536k + 32k																																	
	R5F563NYHDFC	1024k + 32k																																	
	R5F563NKHDFC	2048k + 32k	192k																																
	R5F563NGHDFC	1536k + 32k																																	
	R5F563NWHDFC	1024k + 32k																																	
	R5F563NFDDFC	2048k + 32k	256k																																
	R5F563NJDDFC	1536k + 32k																																	
	R5F563NYDDFC	1024k + 32k																																	
	R5F563NKDDFC	2048k + 32k	192k																																
	R5F563NGDDFC	1536k + 32k																																	
	R5F563NWDDFC	1024k + 32k																																	
	R5F563NEDDBG	2048k + 32k	128k																																
	R5F563NDDDBG	1536k + 32k																																	
	R5F563NBDDBG	1024k + 32k																																	
	R5F563NADDBG	768k + 32k																																	
	R5F563NEDDLK	2048k + 32k	128k			111						1																						LGA 145-pin 7 x 7 mm 0.5 mm		
	R5F563NDDDLK	1536k + 32k																																	
	R5F563NBDDLK	1024k + 32k																																	
	R5F563NADDLK	768k + 32k																																	
	R5F563NEDDFB	2048k + 32k	128k																															LQFP 144-pin 20 x 20 mm 0.5 mm		
	R5F563NDDDFB	1536k + 32k																																	
	R5F563NBDDFB	1024k + 32k																																	
	R5F563NADDFB	768k + 32k																																	
	R5F563NFHDFB	2048k + 32k	256k								2																				AES				
	R5F563NJHDFB	1536k + 32k																																	
	R5F563NYHDFB	1024k + 32k																																	
	R5F563NKHDFB	2048k + 32k	192k																																
	R5F563NGHDFB	1536k + 32k																																	
	R5F563NWHDFB	1024k + 32k																																	
	R5F563NFDDFB	2048k + 32k	256k																												–				
	R5F563NJDDFB	1536k + 32k																																	
	R5F563NYDDFB	1024k + 32k																																	
	R5F563NKDDFB	2048k + 32k	192k																																
	R5F563NGDDFB	1536k + 32k																																	
	R5F563NWDDFB	1024k + 32k																																	

RX600 MCU Series Devices 8/8

Device		Memory		Operation		Interfaces									Timers						Clock			Parallel I/F		Analog					Miscellaneous Information					
Group	Part Number	Flash [Byte]	RAM [Byte]	Max. Clock Speed [MHz]	Supply Voltage [V]	I/O	SPI	SCI	I²C	LIN	CAN	USB (Host/Device/OTG)	USB Device	Ethernet	Timer 8-bit	Timer 16-bit	Motor	IWDT	WDT	RTC	LOCO	HOCO	32.768 kHz	TFT LCD	External Data Bus	10-bit ADC	12-bit ADC	10-bit DAC (12-bit RX64M)	ProgOpAmp	POR & LVD	Security	DMA	DTC	Packages	Qualification	Others features
RX63N	R5F563NEDDFJ	2048k + 32k	128k	100	2.7 – 3.6V	76	2	3	2	–	2	1	–	1	4	16	MTU2	1	1	1 Vbat Anti Tamper	1	1	Yes	Yes	Yes	8ch	14ch	2ch	–	Yes	–	4	Yes	LGA 100-pin 7 x 7 mm 0.65 mm	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; SDRAM Interface; Programmable Pattern Generator (PPG); RTC with Vbat; Ethernet DMA; CRC Unit, Temperature Sensor
	R5F563NDDDFJ	1536k + 32k																																	
	R5F563NBDDFJ	1024k + 32k																																	
	R5F563NADDFJ	768k + 32k																																	
	R5F563NEDDFP	2048k + 32k	128k																															LQFP 100-pin 14 x 14 mm 0.5 mm		
	R5F563NDDDFP	1536k + 32k																																	
	R5F563NBDDFP	1024k + 32k																																	
	R5F563NADDFP	768k + 32k																																	
	R5F563NFHDFP	2048k + 32k	256k																												AES				
	R5F563NJHDFP	1536k + 32k																																	
	R5F563NYHDFP	1024k + 32k																																	
	R5F563NKHDFP	2048k + 32k	192k																																
	R5F563NGHDFP	1536k + 32k																																	
	R5F563NWHDFP	1024k + 32k																																	
	R5F563NFDDFP	2048k + 32k	256k																												–				
	R5F563NJDDFP	1536k + 32k																																	
	R5F563NYDDFP	1024k + 32k																																	
	R5F563NKDDFP	2048k + 32k	192k																																
	R5F563NGDDFP	1536k + 32k																																	
	R5F563NWDDFP	1024k + 32k																																	
RX64M	R5F564MLCDLC	4096k + 64k	512k	120	2.7 – 3.6 V	128	1	13	3	–	3	2	–	2	4	22	MTU3 and GPT	1	1	1 Vbat Anti Tamper	1	1	Yes	Yes	SDRAM	–	29ch	2ch	–	Yes	Optional (AES, DES, SHA, RNG)	8	Yes	LGA 177-pin 8 x 8 mm 0.5 mm	Industrial -40°C to 85°C	FPU; DSP RMPA; Barrel Shifter; SDRAM Interface; Programmable Pattern Generator (PPG); RTC with Vbat; Ethernet DMA; CRC Unit, Temperature Sensor; Trusted Memory; QSPI; SSI; Camera I/F PDC; SDHI I/F optional
	R5F564MJCDLC	3072k + 64k																																	
	R5F564MGCDLC	2560k + 64k																																	
	R5F564MFCDLC	2048k + 64k																																	
	R5F564MLCDFC	4096k + 64k	512k																															LQFP 176-pin 24 x 24 mm 0.5 mm		
	R5F564MJCDFC	3072k + 64k																																	
	R5F564MGCDFC	2560k + 64k																																	
	R5F564MFCDFC	2048k + 64k																																	
	R5F564MLCDBG	4096k + 64k	512k																															BGA 176-pin 13 x 13 mm 0.8 mm		
	R5F564MJCDBG	3072k + 64k																																	
	R5F564MGCDBG	2560k + 64k																																	
	R5F564MFCDBG	2048k + 64k																																	
	R5F564MLCDLK	4096k + 64k	512k			112																												LGA 145-pin 7 x 7 mm 0.5 mm		
	R5F564MJCDLK	3072k + 64k																																	
	R5F564MGCDLK	2560k + 64k																																	
	R5F564MFCDLK	2048k + 64k																																	
	R5F564MLCDFB	4096k + 64k	512k																															LQFP 144-pin 20 x 20 mm 0.5 mm		
	R5F564MJCDFB	3072k + 64k																																	
	R5F564MGCDFB	2560k + 64k																																	
	R5F564MFCDFB	2048k + 64k																																	
	R5F564MLCDLJ	4096k + 64k	512k			79	1	9			2	1	–	1											Yes		22ch	1ch						LGA 100-pin 7 x 7 mm 0.65 mm		
	R5F564MJCDLJ	3072k + 64k																																	
	R5F564MGCDLJ	2560k + 64k																																	
	R5F564MFCDLJ	2048k + 64k																																	
	R5F564MLCDFP	4096k + 64k	512k																															LQFP 100-pin 14 x 14 mm 0.5 mm		
	R5F564MJCDFP	3072k + 64k																																	
	R5F564MGCDFP	2560k + 64k																																	
	R5F564MFCDFP	2048k + 64k																																	

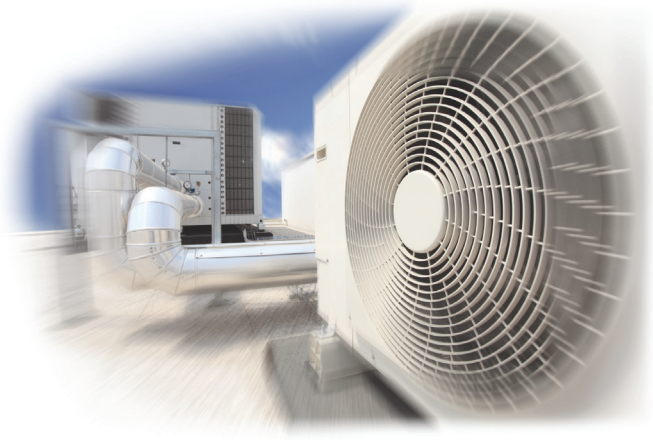
For the RX71M part names please refer to the latest RX71M Hardware Manual.

Design Potential and Versatility of the RX

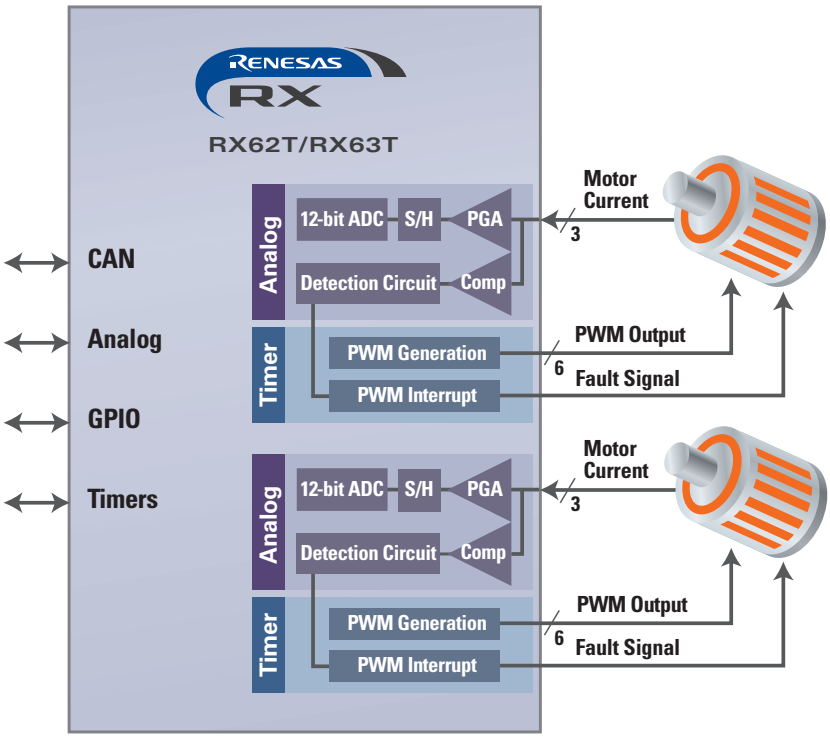
System design versatility, application capability, and economic sensibility are built into the many micro-controllers in the RX family. Driven by a technology roadmap that anticipates more sophisticated applications in the next decade that demand cost effectiveness, RX devices offer abundant core performance and extensive peripheral functions.

RX62T/RX63T for Motor Control

High-performance CPU and FPU capability, and advanced analog and timer peripherals, make the RX62T/RX63T an ideal solution for inverter and motor control applications. Renesas can help you develop your motor control solution with kits and firmware that support many kinds of motor control, including ultra-quiet, energy-efficient, and high-precision three-phase sensorless vector control. In the home appliance example shown here, the RX62T/RX63T is driving two three-phase motors simultaneously using its advanced PWM timers. These timers are well suited for Brushless DC three-phase motors by having complimentary PWM outputs with automatic dead-time insertion, an emergency "Shut-down" (stop) input, and quadrature encoder inputs for speed and direction feedback. The RX62T/RX63T's advanced analog subsystem with multiple sample-hold circuits enables sampling of three simultaneous current measurements. It also offers programmable



operational amplifiers and integrated window comparators to eliminate external components. The 12-bit ADCs have a fast 1 µsec conversion time, can be triggered by the PWM timers, and provide self-diagnostic capability.



Advanced Analog

- Two 12-bit ADC units, each with 4 input channels, 1 µsec conversion time and self-diagnostic capability
- Each 12-bit ADC unit has
  - 3 x independent sample-hold circuits
  - 3 x programmable op amps
  - 3 x analog window comparators
  - 3 trigger sources (PWM timers, external and software)

Advanced Timers

- 100 MHz, 16-bit Multifunction Timer Unit (MTU3)
- 100 MHz, 16-bit General Purpose Timer Unit (GPT)
- Complimentary PWM and Reset-Synchronous outputs
- Dead-time insertion
- Quadrature encoder inputs
- Emergency motor "Shut-down" (stop) input

RX for Connectivity

RX MCUs provide built-in hardware for implementing efficient communications with external peripherals, systems, test equipment and networks such as the Internet. The Ethernet, USB and CAN connectivity modules are well-proven, reliable designs.

Ethernet MAC

- Up to 2ch 10/100 MAC
- 2 KB TX FIFO
- 2 KB RX FIFO
- MII, RMII connection to PHY
- Wake on LAN

USB

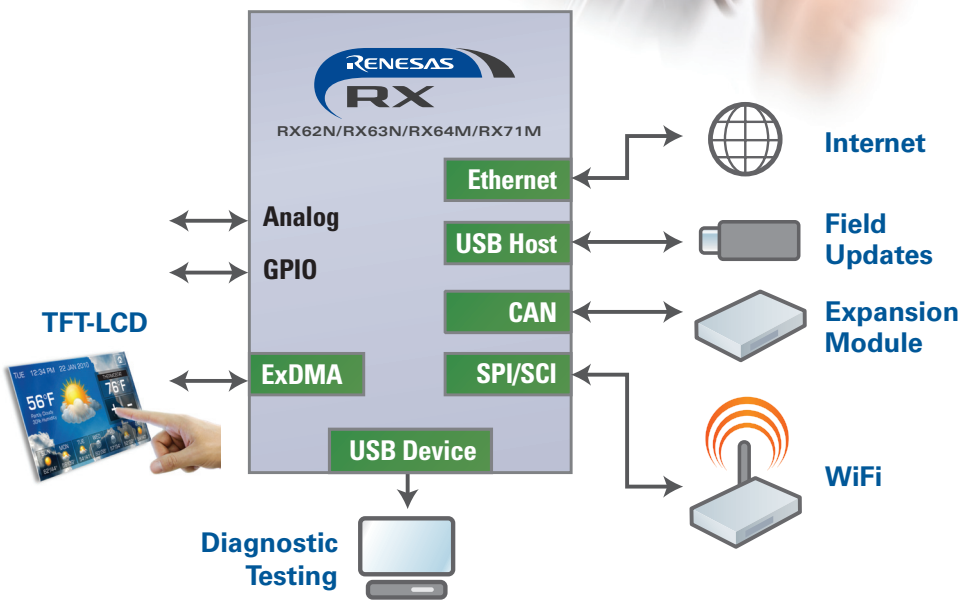
- Host/Device/OTG
- High Speed and Full Speed
- 12 Mbps/480 Mbps
- Up to 2 ports
- 10 Endpoints
- 2 KB FIFO

CAN

- ISO11898-1
- 1 Mbps
- 32 Mailboxes
- Up to 3 channels

SPI/SCI

- Up to 18 MHz (SPI Master)
- Flexible configurations

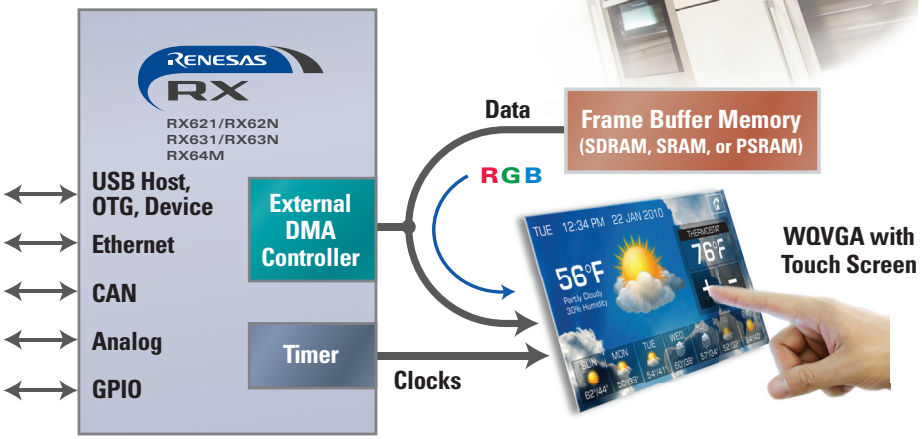


RX for TFT-LCD Applications

The external DMA controller integrated into RX devices can drive a TFT-LCD panel directly, greatly reducing the load on the MCU's CPU; thus, maximizing the performance of application software

External DMA Controller

- Directly drive a TFT-LCD panel
- RGB pixel data moves directly from frame buffer to the TFT-LCD and never enters the RX MCU
- RX CPU is loaded only 5%, while refreshing at 60 Hz
- Plenty of CPU bandwidth remains to run the application, communication channels, and create moderate animation on the TFT-LCD



Get up and running with the RX Ecosystem

Renesas makes it easy to launch new system designs. And our comprehensive range of hardware and software tools – including very low cost and free products – helps swiftly advance the product development process from concept stage to final RX-based design.

System Development Kits

- The Renesas Starter Kit (RSK) facilitates in-depth MCU experimentation and allows system design development

Renesas RX Starter Kit (RSK)

- This complete RX600-based hardware/software platform for in-depth application design includes the E1 Debugger, a trial version of the e2studio IDE, and demonstration firmware.
- The RSKs are specifically designed to be both an evaluation and development system. The kit includes everything that an engineer needs to be up and running within only a few minutes.
- The single installer prepares the target PC with a comprehensive development environment including trial C/C++ compiler, editor, build manager and full source level debugger. A full set of peripheral sample code gives the user an excellent kick start to their project development.
- The kit includes sample code supporting the different peripheral function.

Processor	RSK Part Number
RX610	R0K556100S000BE
RX62N	R0K5562N0S000BE
RX62T	R0K5562T0S000BE
RX630	R0K505630S000BE
RX63N	R0K50563NS000BE
RX63T	R0K50563TS000BE
RX63T-H	R0K5563THS000BE
RX62G	R0K50562GS000BE
RX64M	YR0K50564MS000BE

Application Development Tools

RX MCUs are supported by a comprehensive set of popular Renesas hardware and software tools that have been widely praised for their capabilities and ease of use. Additional support is provided by a dedicated community of third-party experts offering many helpful, time-saving products and services, including the development environments and optimized compilers from KPIT Cummins (GNURX) and IAR. In addition the Renesas C++ compiler allows unlimited binary output size for 60 days; thereafter, restricting compile size to 128 KB.

Compiler Options

Complete Debugging, Emulation, and Programming

On-chip debugging of an RX-based application is performed via JTAG connection to the target and USB connection to the Windows-based IDE. E1 and J-Link offer thorough CPU control and visibility. E20 adds high-speed tracing.

IAR SYSTEMS

RENESAS

Renesas E1
R0E000010KCE00

Renesas E20
R0E000200KCT00

SEGGER
J-Link

e2studio

Based on the popular open source Eclipse environment, e2studio offers a complete integrated development environment based on the free of charge GNU, IAR or Renesas RX compilers. When the powerful project management and editor features of the Eclipse environment are used with the integrated debugging

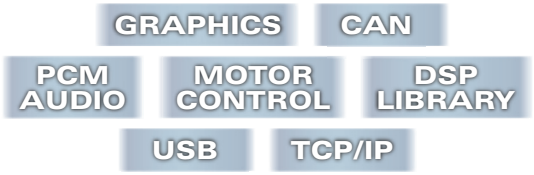
interface e2studio becomes everything you need for embedded RX development. Can be downloaded free of charge or purchased as part of a compiler package.

Part Number: **YRX-E2STUDIO-1U**

Support Software

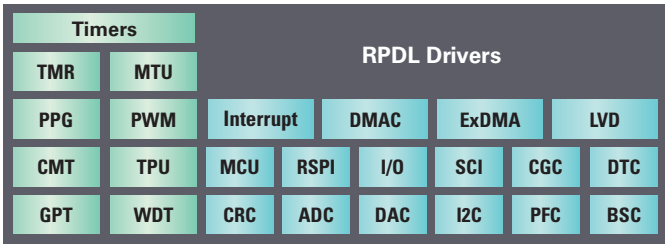
Renesas Software Library

Renesas offers a wide variety of free sample code and libraries supporting applications using Ethernet, USB, CAN, DSP, Motor Control, PCM Audio and Graphics. Renesas also provides the Renesas Peripheral Driver Library (RPDL) and the Peripheral Driver Generator (PDG) free of charge.



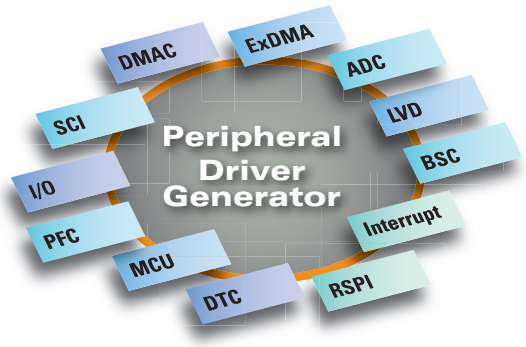
Renesas Peripheral Driver Library (RPDL)

Low-level firmware drivers for all basic RX peripherals are free, source code included. RPDL eliminates the need for creating your drivers, saving time and reducing errors. RPDL functions are easily integrated into HEW projects, and PDG can be used to generate initialization code and calls to RDPL functions based on your own specified configuration.



Renesas Peripheral Device Generator (PDG)

- A Windows user interface for configuring RX peripherals and pins
- Menus to select/initialize peripherals
- Generates C code calls to RPDL driver functions
- Select and manage pin assignments



Third-party RTOS and Middleware

RX600 devices are well suited for embedded real time tasks, high computation, as well as simultaneous data transfers on many high-speed communication channels. Because of this, communication middleware and Real Time Operating Systems (RTOS) are commonly needed. Renesas has established technology partnerships with many leading independent suppliers to provide high-quality, cost-effective solutions.

	RTOS	USB Stack	TCP/IP Stack	File System	Graphic SW	Wi-Fi	BlueTooth	CANopen	Ethercat	Powerlink	Profinet	Java
iAnywhere							✔					
CMX Systems	✔	✔	✔	✔								
Micrium	✔	✔	✔	✔	✔			✔				
Redpine Signals						✔						
SEGGER	✔	✔	✔	✔	✔							
FreeRTOS	✔		✔									
Express Logic	✔	✔	✔	✔	✔							
Sciopta	✔											
port								✔	✔	✔	✔	
Thesycon		✔										
IXXAT								✔				
HCC embedded		✔	✔	✔								
TMG											✔	
Wittenstein	✔		✔									
Gainspan						✔						
Sevenstax			✔									
IS2T												✔

Solution Kits for RX

RX Direct-drive Solutions for TFT-LCD

A quick and easy solution to add colour TFT-LCD to your design

- Low-cost 32-bit MCU solution to drive colour TFT-LCD panels up to WQVGA resolution
- Only 5% loading on CPU when refreshing the TFT-LCD panel at 60 Hz, with ample bandwidth left for running the rest of the application
- Free graphics API library and examples for evaluating graphics
- Third-party support for additional graphics requirements

Part Numbers:
YLCDRSKRX62NS (Processor RX62N)
YDISPLAY-IT-RX (Processor RX63N)

Motor Control Solutions Using the RX MCU

A solid evaluation and development platform for motor control

Features

- Auto tune & calibrate
- Sensor/sensorless
- Ability to drive 2 motors
- Royalty free source code
- BLAC motor up to 48 V
- PC control GUI
- Full schematics
- Tune & calibrate tutorial

Kit content

- Inverter board
- 24 V BLAC motor
- Quick start guide
- CD-ROM including full source code, Gerber files, schematics, user manual, tutorial & more

Part Number:
YROTATE-IT-RX62T

Renesas RX62N RPB Board

RX62N Webserver Demo kit with outstanding test routines you could do via network

- HTML file hosting
- FPU function test by bouncing ball and Mandelbrot calculation
- DMIPS MCU benchmark
- "Pong" Mini game
- Features
- Real-Time IEEE-1588 Ethernet PHY
- USB device port
- Mini Joystick
- Connection port for fast prototyping

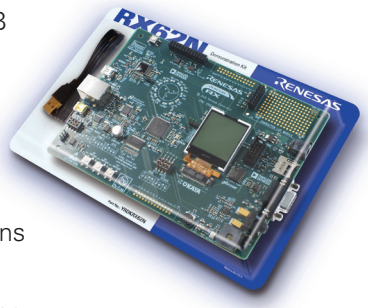
Development Environment

- Renesas HEW IDE
- Built-in SEGGER J-Link Lite debugger
- Demo Source code and libraries

Part Number:
YRPBRX62N
(Contact your sales channel for availability)

Renesas Demonstration Board (RDK) for Seminar purpose

This board plugs into a PC's USB port to showcase the features and capabilities of RX600 MCUs



- RX MCU board with J-Link integrated debugger and huge peripheral set, including Ethernet, CAN and USB
- Graphic display
- 3-axis accelerometer
- Audio in/out
- Board will be supplied during hands-on sessions seminars
- Installation CD containing:
  - High-performance Embedded Workshop (HEW)
  - RX Family C/C++ toolchains (Renesas 128 KB evaluation version, full GNU version)
  - Quick-start guide, sample projects

Part Numbers:
YRDKRX62N (Processor RX62N)
YRDKRX63N (Processor RX63N)
(Contact your sales channel for the next seminar in your area)

Functional Safety Solution according IEC61508-2010 (2nd Edition)

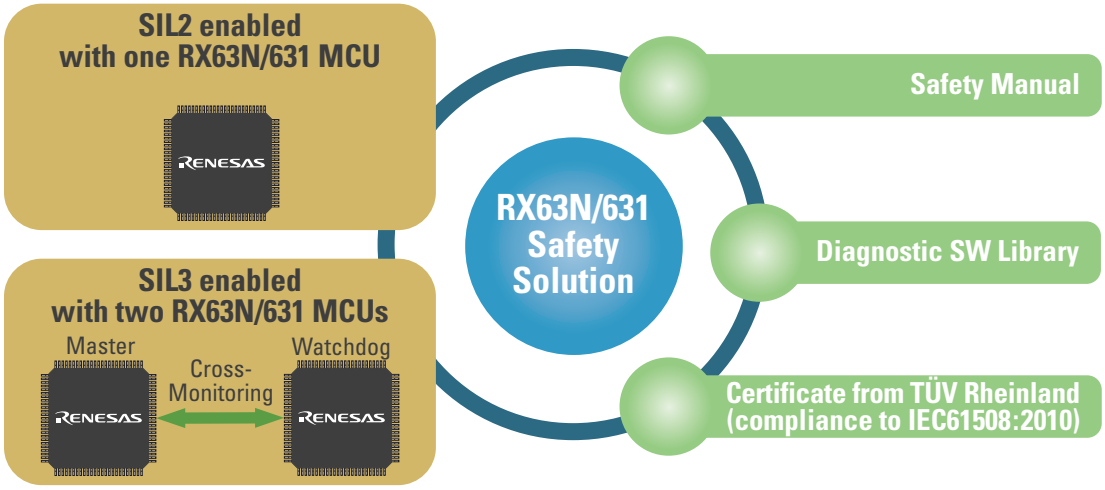
The number of embedded systems with functional safety requirements is steadily growing. Components with a safety certification have a clear advantage, they support the system safety developer with all necessary information on how to include the component and provide the required evidences for the claimed safety integrity level (SIL).
To enable a seamless integration into safety applications, a qualification package for the RX63N/631 microcontroller series is available. It includes a safety manual containing the results from a comprehensive analysis based on each function part of the microcontroller, and all relevant information and procedures related to functional safety. A high quality diagnostic software library for the CPU core, for RAM and Flash is provided. The diagnostic coverage of the CPU core is proven by fault simulation tests. The qualification package is certified by the TÜV Rheinland to ensure compliance to the standard.

Applications

- Industrial Motor Drives
- Safety Controllers
- Programmable Logic Controllers
- Safety Sensors

Key Benefits

- MCU Safety Manual with relevant information to functional safety
- Diagnostic SW library containing test routines for RX CPU core, RAM, and ROM
- High quality RX CPU core self-test, diagnostic coverage proven by fault simulation tests
- Diagnostic SW developed for IEC61508 SIL3
- Applicable to all part numbers of the RX63N/RX631 product groups
- Certificate from TÜV Rheinland
- IEC61508 compliant IAR Embedded Workbench for RX



Safety Solution Scheme

Solution Packages

- Renesas Starter Kit+ for RX63N
- Diagnostics library for CPU, RAM, and ROM
- Diagnostics Software User Guide
- Safety Manual Evaluation Version
- IAR Installer EWRX-FS v2.42.4 (Evaluation Version)
- Quick Start Guide
- Video

Functional Safety Production License

- Diagnostics library for CPU, RAM, and ROM (Source Code)
- Diagnostics Software User Guide
- Safety Manual Full Version
- Certificate & Test Report from TÜV Rheinland

Order Code

- YCERTIFY-IT-RX63N-EV
- YCERTIFY-IT-RX63N-PR

RX is Online – www.renesas.eu/rx

Renesas makes product data, design and application information, and much more available 24/7 in the RX area of our website. Bookmark it and visit it often to get the latest data on the newest and previously released devices, learn details about (and download free versions of) system development tools, use time-saving MCU-selection aids, participate in discussion forums, find out about upcoming events, take advantage of special promotions, and more.

Additional Renesas MCU Support

The Alliance Partner Program allows you to connect instantly with hundreds of qualified design consulting and contracting professionals.
www.renesas.eu/alliance

For educators and students. Teach with professional grade tools.Learn MCUs with a modern architecture.

www.renesasuniversity.com

Gain the technical knowledge you need. Research and learn at your own pace, where you want, when you want, for free.

www.renesas.interactive.com

Gathering place for technical information on Renesas MCUs and MPUs.

www.renesasrulz.com

Before purchasing or using any Renesas Electronics products listed herein, please refer to the latest product manual and/or data sheet in advance.

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